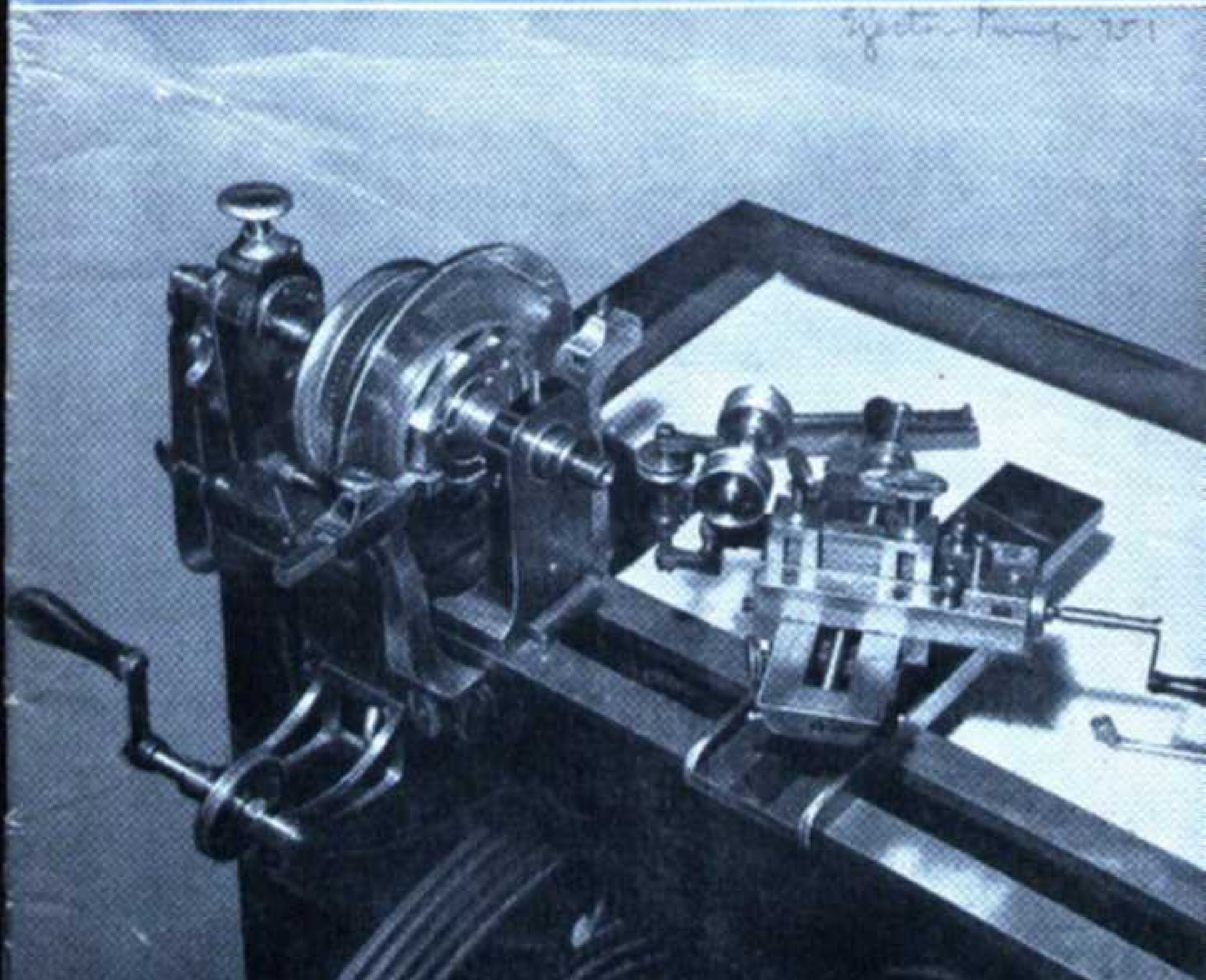
THE MODEL ENGINEER

T.S.

Injector Pump 751



IN THIS ISSUE

- A LATHE MILLING ATTACHMENT
- READERS' LETTERS
- A PORTABLE COMPRESSOR UNIT
- QUERIES AND REPLIES
- MODEL FLAME INJECTION ENGINES
- TWIN SISTERS
- GENERAL MODELS AT THE NORTHERN MODELS EXHIBITION

JUNE 18th, 1953
Vol. 108 No. 2717

9D

THE
MODEL ENGINEER

EVERY THURSDAY

Volume 108 - No. 2717

JUNE 18th, - 1953

ESTABLISHED 1898

PERCIVAL MARSHALL & CO. LTD. 19-20 NOEL STREET · LONDON · W·1

CONTENTS

SMOKE RINGS 725
L.B.S.C.'s LOBBY CHAT
Locomotive Lighting 726
A CLUB'S NEW LOCOMOTIVE TRACK 731
GENERAL MODELS AT THE NORTHERN MODELS EXHIBITION 732
A GEARED HAND-DRIVE FOR THE LEADSCREW 734
IN THE WORKSHOP
A Lathe Milling Attachment 737
A USEFUL AIR COMPRESSOR FILTER 741
TWIN SISTERS 742
"PUFFING BILLY"—A STEAM TRAMWAY ENGINE 745
MODEL FLAME INJECTION ENGINES 747
A PORTABLE COMPRESSOR UNIT 748
READERS' LETTERS 750
QUERIES AND REPLIES 752
WITH THE CLUBS 753

Our Cover Picture

The type of machine known as a Rose (or Rosette) engine turning lathe was originally introduced for producing mechanical ornamentation on metal articles, and it is interesting to note that although the machines are now obsolete, the geometric patterns are still popular, and still known as "engine turning." The patterns were produced by a reciprocating motion of either the tool slide or the mandrel carrying the work, controlled by multi-lobed cams or "rosettes" which could be changed to vary the designs. Normally, such machines were not classed as lathes in the accepted sense, but the machine shown in the photograph, which was introduced by Jno. Muckle, of Cripplegate, about 1830, was suitable not only for rose turning but also for a wide range of plain and ornamental turning, including spherical and other curved contours. Being much simpler than the elaborate and expensive lathes by Holtzapffel and others, it was popular among craftsmen who carried out this work for a living. The example illustrated is now in the possession of Capt. J. C. Davis, R.N. (Retd.), to whom we are indebted for the photograph.

SMOKE RINGS

A Southern Counties Exhibition

WESSEX EXHIBITORS LTD., of Winchester, are planning to hold a Southern Counties Model Engineering Exhibition in the Guildhall, Winchester, early in March, 1954. A meeting to discuss the relevant details and arrangements will be held at the Westgate Lodge Hotel, Winchester, on Sunday, June 28th next, 2.30 p.m., and as many model engineering club representatives as possible are invited to attend.

The term "Southern Counties" covers those counties south of London, viz.: Surrey, Sussex, Kent, Berkshire, Hampshire, Wiltshire, Dorset, Somerset, Devon and Cornwall.

Organising Secretary, Mr. G. H. Bell, Wessex Exhibitors Ltd., 32A, The Square, Winchester, Hants.

Without Comment

THE CURRENT issue of a journal issued by a well-known engineering firm contains an interesting description of a somewhat unusual diesel engine installation as a replacement for an earlier power plant in which it was found necessary to extend the supporting structure beyond the original foundation block on steel joist bridges. Quoting verbatim from the article "... concrete was then run over these bridges up to the required level for the new set by the ——— Engineering Staff. *In spite of this*, the engine when running is remarkably free from vibration ..."

The italics are ours.

Television in Colour

ONE OF the most significant triumphs of the Coronation festivities was the successful transmission of a television broadcast to the whole of the British Isles and to parts of the Continent and America. In this way, literally millions of people were able to follow practically the whole of the proceedings by sight as well as by sound, and this in itself is a pointer to some of the wonderful developments that have taken place in the sixteen years that have elapsed since the previous Coronation.

But, perhaps not so widely known, yet a harbinger of things to come, was the private television broadcast undertaking by Pye Limited, of Cambridge, in collaboration with Chromatic Television, Incorporated, of America, who between them arranged a programme *in colour*, for the benefit of the children at the Great Ormonde Street Children's Hospital in London.

This was, we believe, the first outside colour-television broadcast ever attempted, and we understand that it was successful. Events move quickly, these days!

"London on Wheels" Exhibition

AN INTERESTING exhibition, staged in the Shareholders' Meeting Room at Euston station and opened on May 20th by Lord Hurcomb, provides a vivid indication of the development of London's road, rail and water transport during the nineteenth century. An astonishing collection of pictures, prints, photographs, models, tickets and examples of actual equipment has been collected together and arranged as far as possible in progressive order, and the effect is fascinating to a degree.

The majority of the exhibits are owned by the British Transport Commission, while others have been borrowed for the occasion.

The room in which this exhibition is laid out is itself of considerable historical interest; it was formerly used for meetings of the shareholders of the London & North Western Railway and, later, the London Midland & Scottish Railway, and is thought to be the only room ever provided specially for meetings of railway shareholders. It dates from 1849 and has recently been redecorated and restored as nearly as possible to the specifications of Philip Charles Hardwick, the original architect.

The present exhibition will remain open until August 29th, 10 a.m. to 7 p.m. on weekdays and 2 p.m. to 7 p.m. on Sundays.

L.B.S.C.'s Lobby Chat

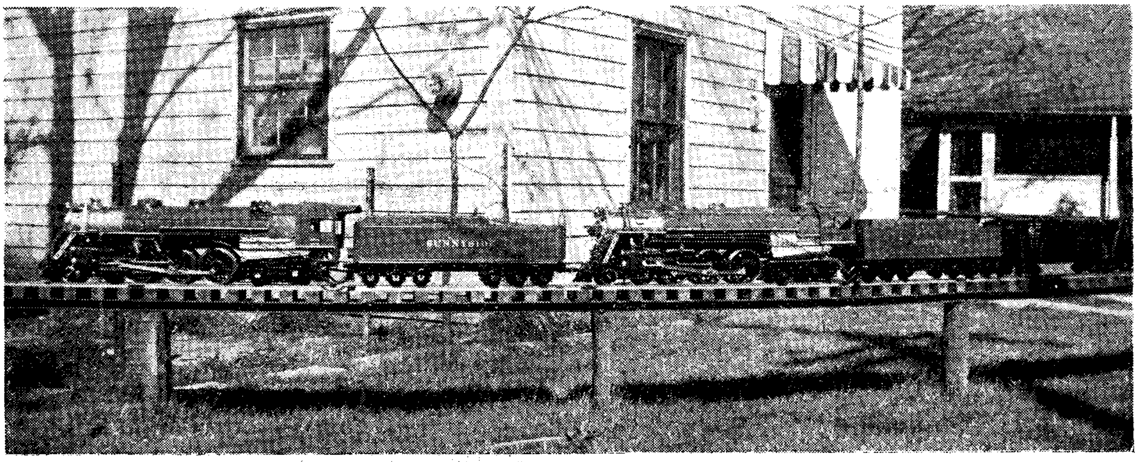
● LOCOMOTIVE LIGHTING

SOME time ago, our worthy Knight of the Blue Pencil quoted an extract from a letter sent by an overseas correspondent, on the subject of headlights on British locomotives, and commented on it; and there were also some comments in the correspondence columns. One thing leading to another, some of my direct correspondents asked if I knew why the majority of British locomotives still relied on oil lamps for their destination and classification lights. They argued, quite reasonably, that even if head-lamps were not needed to show the road ahead, any modern locomotive like *Britannia* should have at least the same refinement in the way of lighting, as the cheapest gasoline buggy on the market. I've often wondered at the same thing myself; but the explanation of the "powers that be," is that electric lighting is expensive, and there are technical difficulties to overcome. Personally, I don't accept either explanation as valid; the cost of a simple 6-volt set, for instance, would only be a wee fraction of the cost of, say, a *Britannia*. As to technical difficulties, they don't exist. Not even a reversing dynamo for either-direction charging would be needed, because the dynamo could be driven by a little turbine, as on American and Colonial engines. The Clarkson steam buses, which were once familiar objects in the streets of London, were brilliantly lit from a little dynamo on the drivers' seat, operated by a two-cylinder direct-coupled vertical engine, similar to those advertised at one time by Stuart-Turner. One good feature of the Southern "spam cans" is their electric lighting; their designer certainly scored a point there!

My correspondents say, what about getting one jump ahead, and providing our little engines with electric lighting? Some of them have tried to make oil lamps that will burn; but again, they are up against the fact that Nature won't be "scaled," and there is not sufficient air space, even in a lamp for a 5-in. gauge engine, to support combustion. Even the weeniest flame needs "breathing space." Well, electric lighting on little engines is nothing new at all! I know of several British locomotives of 2½-in. gauge and upwards, that are equipped with electric lights, a torch battery being carried under the tender, and tiny surgical or dental bulbs being installed in the usual type of oil-lamp casing. The one-wire system is used, return current running through the metalwork of the engine itself. Over 25 years ago, I fitted up an electric gauge-lamp, beside the water gauge, on the late Bill Irvin's 3½-in. gauge Great Northern Atlantic (a similar engine to *Maisie*) using a tiny surgical lamp, and the same system of wiring. My 2-6-6-4 American Mallet *Annabel* has a working headlight, at present battery-operated; and thereby hangs a tale.

The Real Goods

All American engines are required by law, to carry powerful headlights. Those readers who only know of British lines, fully signalled, and fenced in for the whole of their length, find it hard to imagine single lines running through desolate country, with no block signals, and no fencing along the right-of-way. If the locomotives using these routes did not carry a headlight showing the line for about a quarter-mile or more ahead, the enginemen would be unable to stop clear of unexpected obstructions at night, such as wild cattle wandering over the track. Where there are no block signals, trains are regulated by a dispatcher, who times them, when running in opposite directions, to meet at places where there is a passing loop. Human nature not being infallible, it sometimes happens that two trains



Part of Sunnyside R.R. with Mr. R. E. Thompson's locomotives

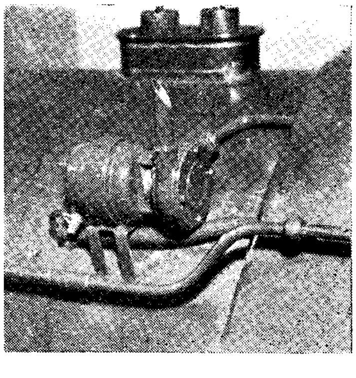
will enter a single-line section at opposite ends—an extremely rare occurrence; but the powerful head-lights being visible a couple of miles away, the enginemen can easily stop in plenty of time to avoid what they call a "cornfield meet."

When our transatlantic cousins started small locomotive building, they naturally fitted miniature head-lamps and classification lamps; and when these lamps were made to light up, the usual torch battery or small accumulator was pressed into service. But this didn't satisfy our worthy friends; the big engines had turbo-generators to supply the juice —why shouldn't the little ones have the same? The trouble, of course, was the size. The generators are usually mounted on top of the boiler; and that called for a very weeny edition of the full-sized article. However, they tackled the problem, and the working turbo-generator has now been in use for some time past, lighting the head, cab, and classification or "marker" lamps on 3½-in. gauge American locomotives. The two worthy brothers responsible for this little (literally!) bit of realism, are Otha Hege and Frank Kaylor, of Lexington, North Carolina, who perfected the miniature working turbo-generator about a year-and-a-half ago. Otha was responsible for the Milly-Amp-part, and Frank for the spinning-jenny, and their combined efforts have certainly produced a realistic and effective gadget.

"Annabel" Gets a Turbo-generator

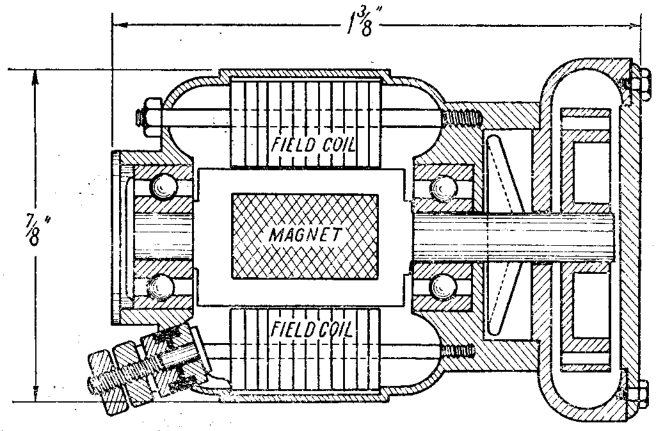
The construction was fully described by Bobby Thompson, of the Southeastern Live Steamers, in the *Miniature Locomotive*, beginning in the September-October, 1952 issue. This lively and up-to-date American journal has been reviewed, and advertised, in our own columns; and the worthy editor, Dick Bagley, regularly sends me copies. Bobby described the "how-to-do-it" in the same fully-detailed style which I use for beginners' instruction in my own notes; and being interested, I thought that if only I could squeeze the time in somehow, I would make a turbo-generator for *Annabel*, to use in place of a battery. However, a kindly fate took pity on my lack of time, and I got one without the trouble of building it myself! Bobby has followed my notes for many years, and has profited thereby, as you can see from the pictures of his fine Southern 4-6-4, reproduced here; and as a mark of appreciation, offered through a mutual friend, George Murray (who handles P-M publications in his part of U.S.A.) to send one as a free gift. This offer, it is hardly necessary to add, was accepted with avidity; and a few days ago, time of writing, the little gadget arrived. It is on the table here as I write, as I haven't had time to fit it on top of *Annabel's* boiler yet.

Externally, it is a perfect reproduction of the full-sized article, and about the correct size for a 3½-in. gauge locomotive. The dynamo part is ⅞ in. diameter and 1 in. long, the base which bolts to the boiler bracket being ¾ in. square. The turbine casing is 1⅛ in. diameter and 9/32 in. wide, and contains an aluminium impeller a full ⅝ in. diameter and ⅛ in. wide. The shaft runs on two weeny ball-bearings; and between the turbine and generator casings, is a deflector disc which will throw off any moisture that might get out of the turbine-casing. The principle on which the dynamo works, is just the reverse to that used



Turbo-generator erected on 3½-in. gauge locomotive

in generators of the kind made for electric lighting on pedal cycles, and suchlike jobs; these nearly all have a permanent-field magnet and a wound armature. The weeny gadget has a rectangular permanent magnet in the armature or rotor, so that there are no brushes or slip rings, and the rotor runs perfectly free. This is an advantage, as such a small generator necessarily has to run at a terrific speed (upwards of 10,000 r.p.m.) to light even one lamp; and as the little generator will light four lamps, working with the boiler pressure at 80 lb. you can guess how fast the armature turns. The field coils are wound with enamelled wire on a laminated frame, the laminations being made from 0.015 in. sheet steel, as used for radio transformers. The normal output of the little generator which was sent to me is 2.5 volts, 1 amp., the current being alternating and of high frequency. I hope to mount it on *Annabel* in the very near future, and it will be of use, as our little railway often operates after dark, just the same as its full-sized relations. Meanwhile, I have forwarded Bobby Thompson one of my little injectors, to feed his locomotive with another variety of juice—one good turn deserves another!



Section of Hege-Kaylor turbo-generator for 3½-in. gauge locomotive. (Twice full size)

What a Lot of Pieces!

Now and again, a beginner correspondent will tell me that whilst the drawings of the various parts of the locomotives illustrated in these notes, are plenty clear and simple enough for him to follow, he would like to see a photograph of the part finished and ready for erection. Others often ask how long such-and-such-a-job should take, as they keep on working for many hours, and apparently have so little to show for it, that they rather feel down-hearted, and wonder whether the

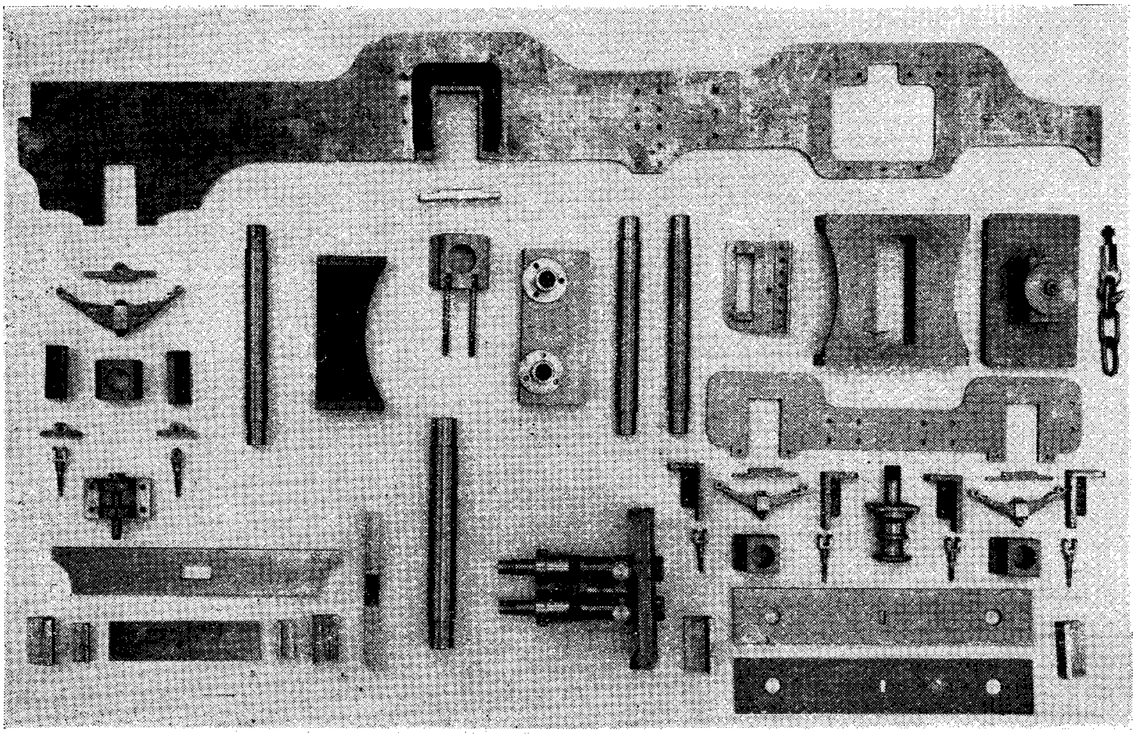
engine will ever be finished. Now it so happens that a recent communication from the builder of the super-de-luxe *Tich*, known as *Pimples* because it has a perfect rash of them all over it, contained some photographs of finished parts, and also a table showing the time taken on each job. The whole issue is reproduced here, and provides an illuminating study, relating to the points raised.

My way of building a locomotive, is to start by erecting the main frames, and then make and fit all the parts to it, each part being made in the order in which it is required, and erected right away. As I don't use any drawings for my own jobs, this method is perfectly satisfactory; and in the rare event of something not being the right shape or size, correction can be made immediately, I don't have to " go back," and don't lose time; both very important considerations at my time of life. However, anybody working to "guaranteed" drawings, may prefer to make some, or all, of the parts before starting the erecting job. In full size, of course, the various parts are all made in different departments, each specialising in some particular component, and they are all brought to the erecting shop to put together. I recommend my own method, even when " guaranteed " drawings are available, because anybody is liable to make an error in machining; and it is annoying, to say the least, to " come to a dead stand on the bank " and have a job to start again, in a manner of speaking.

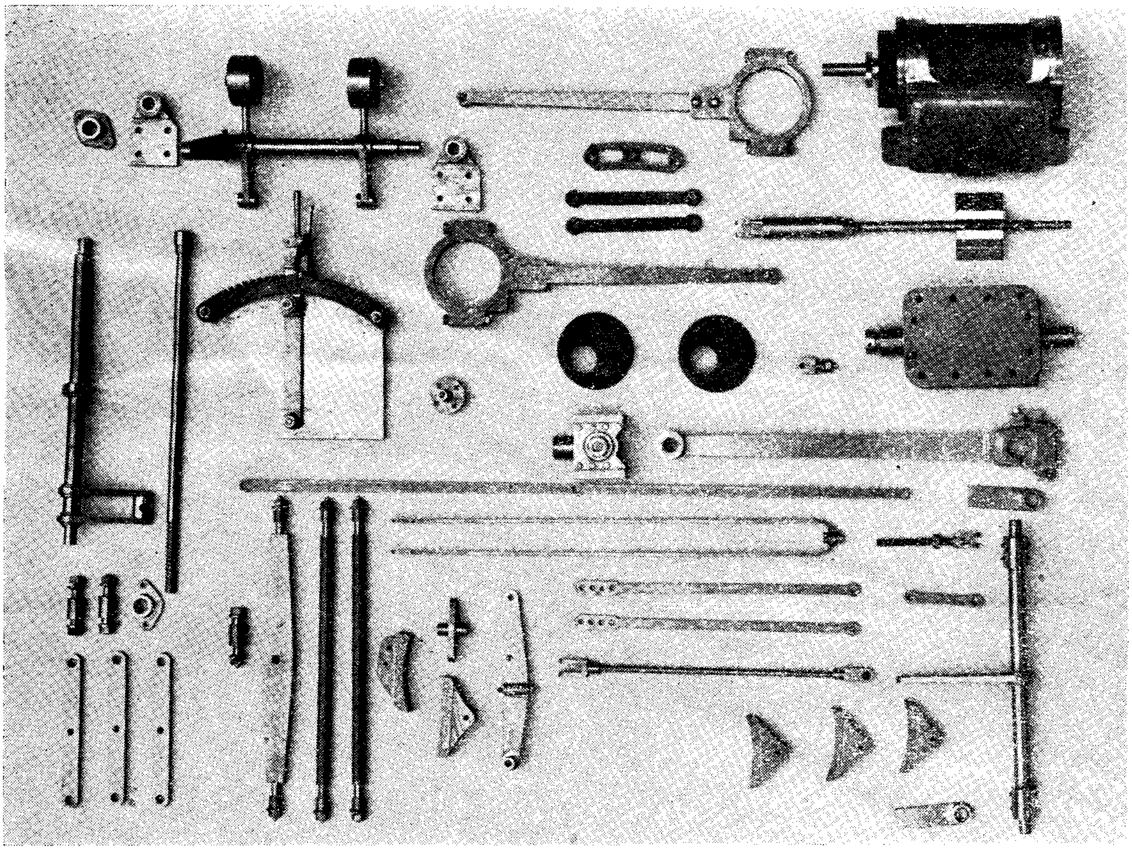
However, it would be a pretty dull world if everybody thought and acted alike ! Now, our worthy friend who built *Pimples*, is a very competent engineer, and a thoroughbred craftsman. He was connected for many years with a trade which assembles finished motor components into complete automobiles, in a manner a jolly sight easier than putting together the bits of any jigsaw puzzle. Therefore, his preference for making all the bits first, and then assembling the lot at one fell swoop, can be readily appreciated. At the time of writing, he is busy on a $3\frac{1}{2}$-in. gauge Great Northern eight-foot single-wheeler, Pat Stirling's most famous class, and the accompanying photo-reproductions show some of the pieces of it, all ready for erection. I understand that he is working to the drawings, and using the castings, as supplied by Mr. H. P. Jackson, of York. Anyway, the photographs " speak for themselves "; as I have remarked before, there is no need to try to gild the lily. Parts worthy of special attention are, the expansion-link and die-block, the connecting-rod big-end; the working leaf springs, and hangers for same; the reversing lever, and balanced weighbar shaft; the square-thread screw on the hand brake spindle, and the adjustable brake rigging. Knowing our friend's capabilities, I don't think that there will be much fear of the parts shown, giving trouble when the engine is erected.

How Long Would YOU Take ?

The builder said that maybe a detailed list of the hours spent on each piece, would be of interest to your humble servant. He knows that I have to work mighty fast, to get anything done at all, owing to the writing, drawing, and other necessary work for keeping these notes going, and guaranteeing results. I only wish to goodness that I could draw out and describe a locomotive as quickly as I could build one, if I could keep straight on at the job, without distraction. I have made a pair of cylinders for a $2\frac{1}{2}$-in. gauge



Main frames, bogie parts, pumps, etc., for Stirling 8 ft. single-wheeler



Cylinder, motion parts, and brake gear for $3\frac{1}{2}$-in. gauge Stirling 8 ft. single-wheeler

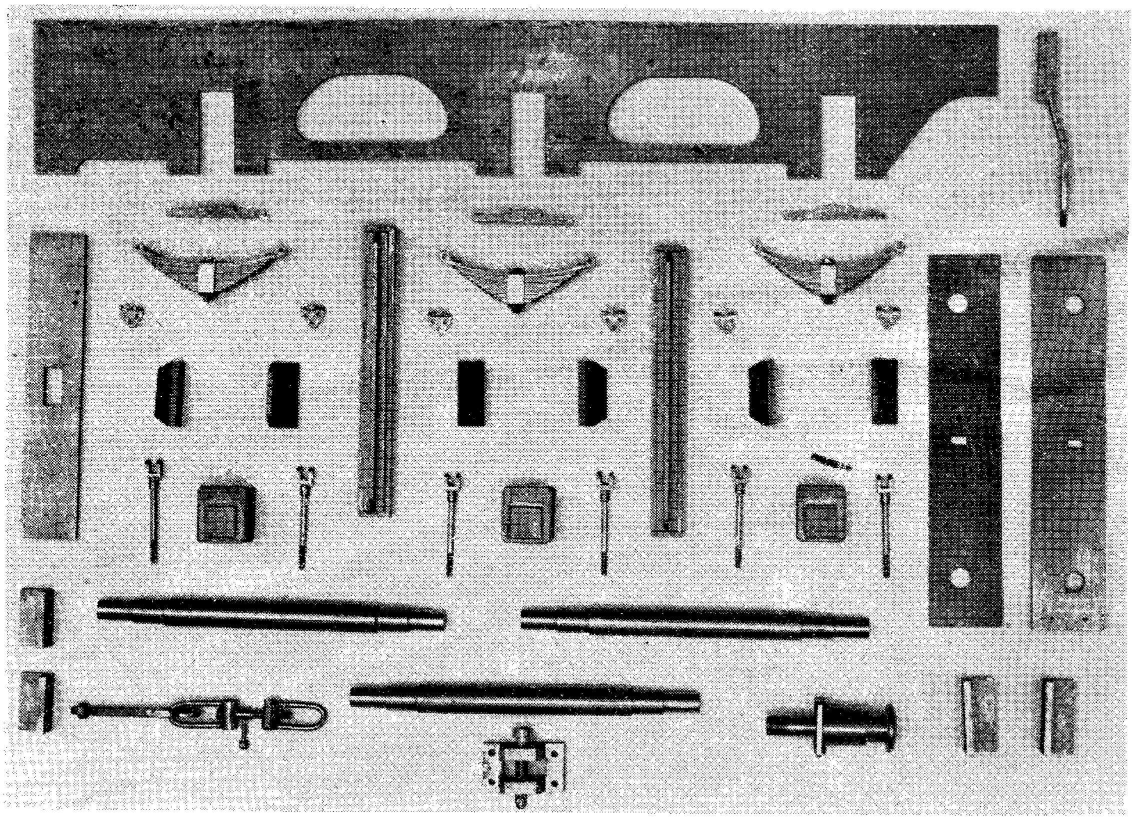
4-6-0 locomotive in two days, and built the boiler for it in $17\frac{1}{2}$ hours. Our friend's times were as under :—

Main frames	$19\frac{3}{4}$ hrs.
Bogie frames	$10\frac{3}{4}$,,
Tender frames	$11\frac{3}{4}$,,
Buffer beams	$14\frac{1}{2}$,,
Cylinders	78 ,,
Pistons	3 ,,
Valves (with spindles and bushes)	32 ,,
Engine frame stays and bolster	$18\frac{1}{2}$,,
Bogie centre	$18\frac{1}{2}$,,
Connecting rods	59 ,,
Eccentrics and rods	$36\frac{1}{2}$,,
Buffers	$22\frac{1}{2}$,,
Expansion links and die-blocks	27 ,,
Lifting links	7 ,,
Guard irons	11 ,,
Axles	8 ,,
Engine axleboxes	$18\frac{1}{2}$,,
Tender axleboxes	7 ,,
Engine hornblocks	4 ,,
Tender horncheeks	$4\frac{1}{2}$,,
Weighshaft and bearings	21 ,,
Tender frame stays	4 hrs.
Guide bar brackets	11 ,,
Working leaf springs	$100\frac{1}{2}$,,
Brake gear	$95\frac{1}{2}$,,
Reversing lever	$25\frac{1}{2}$,,
Driving wheels	$17\frac{1}{2}$,,
Carrying wheels	20 ,,
Various oddments (couplings, running - board brackets, various other brackets, lugs, drawbar fittings, etc.)	58 ,,

The total number of separate parts in the above list, not including bolts, nuts, pins, and rivets, tots up to 549; and the total hours spent, comes to $784\frac{3}{4}$. When the quality of the work is taken into account, the time is quite reasonable; but some of the items may cause surprise to the uninitiated. The $100\frac{1}{2}$ hours for the working leaf springs, for example—I know—I've had some ! ! Anyway, to cut a long story short, it looks as though this engine is going to be a worthy sister to *Pimples*, as far as the workmanship and finish are concerned; and I also have no doubts about how she will be able to steam and pull, as the little tank engine can do her full share of both. It is hardly necessary to add that I shall be looking eagerly forward to the day that she makes a trial run on my own little railway.

Diacro Tail Lamp

To save unnecessary correspondence sent either to our offices, or your humble servant, asking for information about the Diacro products, they are not made in this country, and at time of writing, there are no British agents. The machines are made by the O'Neil-Irwin Manufacturing Co. of Lake City, Minnesota, U.S.A., and several readers of this journal have purchased machines similar to my own, direct from the firm. How I came to be lucky enough to make the acquaintance of the president of the firm, was simple—he followed these notes ! He first wrote to the late



Tender parts for Stirling 8 ft. single-wheeler

Mr. Percival Marshall, and then to me; a " pen friendship " was started, which has grown stronger as the years rolled on. In addition to the bending brake, I now have a 12-in. precision shear which cuts 16-gauge hard steel, *or wet tissue paper*, with equal facility; a rod, tube, and channel bender which thinks nothing of turning a piece of channel steel into the letter S, if required; and a rod parting machine which will, for example, chop off boiler stays to precision length, as fast as you can feed the rod into the machine and pull the handle. At the time of writing, one of the firm's rolling machines is on the way. My great regret is that I didn't have these " aids to mass production " when these notes first started; but they weren't in existence then !

My good friend the president of the firm, is a real steam locomotive enthusiast, owns several locomotives, and has recently moved into a new residence with plenty of ground. He is now putting up a long railway like a succession of girder bridges, made entirely of welded steel; and I hope to show some photographs, and give a description of it, ere many moons have passed.

CATALOGUES RECEIVED

Messrs. Kennion Bros., (Hertford) Ltd., 2, and 2a, Railway Place, Hertford, Herts, have sent us their latest catalogue of tools and materials, in which is listed a wide range of brass, copper and steel in bar, sheet and tube form, bolts, nuts and screws in sizes from 2 to 12 B.A., and other model engineering materials. The tools listed include the full range of " K-B " brand taps and dies in all standard threads, twist drills, die-holders, tap wrenches, and other hand tools. The name of Kennion Brothers holds a high reputation among model engineers for quality and service, and their goods can be recommended with confidence to our readers.

Messrs. Charles Frank, 67-73, Saltmarket, Glasgow, have sent us their new illustrated list of optical instruments, which include many items of *ex*-service and *ex*-enemy equipment, such as telescopes, binoculars, range-finders, sextants, etc. A special feature is a wide range of optically-worked lenses and prisms, of various focal lengths and types, also constructional kits for astronomical telescopes, episcopes, microscopes, etc. Surveying instruments, compasses, magnifiers and drawing instruments conclude the list of items, and all goods are fully guaranteed, and may be obtained on approval if desired.

A Club's new LOCOMOTIVE TRACK

Mr. Collins, of the Exeter M.E.S., drives his club locomotive

ON Saturday May 9th, the Newton Abbot & District Model Engineering Society's passenger-carrying railway in the Penn Inn Park was opened by the chairman of the Newton Abbot Urban Council, Mr. N. P. Roberts, J.P. who is president of the society. It was a great day for N.A.D.M.E.S. members, also for visiting societies who came, some with locomotives, from various parts of Devon, Cornwall and Somerset. All had great praise for the enterprise of the society—the youngest in the South-West area. A well-known member of one of the oldest societies in the area remarked that N.A.D.M.E.S. had certainly "shown up" the South-West by its go-ahead policy which the club has adopted ever since its inauguration five years ago. The site, which is very picturesquely situated, was decorated with shields, emblems, B.R. posters and 480 ft. of pennant flags, banners, etc.

The First Run

At 3 p.m. H. J. Cooper, vice-president, after a short opening speech, asked the chairman of the council to open the railway. The chairman, his speech delivered, and with his wife and the Clerk of the Council, climbed aboard the waiting train headed by a *Heilan' Lassie* built by I. C. Moxham, vice-chairman of the society. With a blast on the whistle he drove off to break the red, white and blue tape stretched across the track, amid cheers from over a thousand spectators. Later, the track was cleared, and some 450 passengers were carried without mishap.

The track marshal, L. Hunt, prepared a running time-table for the nine locomotives present, but it could not be adhered to, owing to the number of "customers." At times there were three locomotives on the track, which called for some efficient signalling, but all went well, and each of the locomotives present got in at least a full hour's running on the track.

The Track

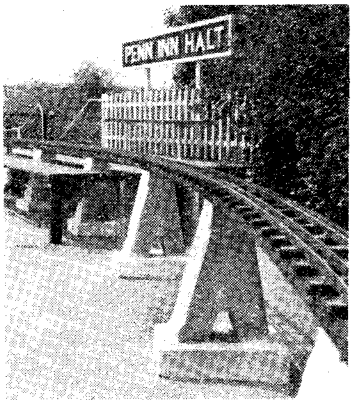
This is roughly egg-shape, 366 feet round, with one 40-ft. radius and two 35-ft. radii. The 1-in. × $\frac{1}{4}$-in. steel rails are supported on sleepers which lie across a double circuit of 2-in. × 2-in. × $\frac{3}{16}$-in. angle-iron, clamped to the concrete "A" shaped pylons, which vary in height from 10 in. to 2 ft. 7 in. There is also a turntable (which does not wobble about) to run the locomotives to and from the steaming bay. Adjacent to the steaming bay is a water tank, the base of which is used for an oil and coal store. The tank has a pipeline to it and can easily be filled by hose from a nearby tap.

The show-piece is perhaps the station—Penn Inn Halt—the foundation of which is built up with concrete blocks, and is in the form of three walls with staggered ties for strength. The plank platform is laid on top of the foundation, and is so constructed that it can be removed during the winter months. It is 13 ft. long, and is a double one, i.e., on both sides of the track. At the rear is a wooden railing of the type seen on railway stations. The station board is typical of that seen on the full-size railways; it has raised letters cut out of wood and screwed on the baseboard. The station is painted cream and brown, the G.W.R. station colours. The whole railway is fenced in from the public, so that nobody can stray on to the line. There is also a guard-rail at the steaming bay to keep operators there from getting too near the track.

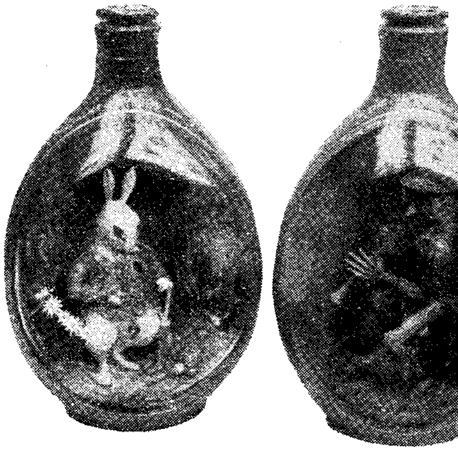
The society is insured against third-party risks and boiler burst. A test committee has been formed and all boilers and cars have to be examined before going on the track. The third-party insurance is covered by the society funds, but that against boiler burst, though handled by the society, is paid by the owner of the boiler. Each boiler is insured for £5,000 and the owner pays a premium of 15s. per year to the society. When a boiler has been passed by the Test Committee, the owner receives a Test Certificate which also acts as a receipt for his 15s. Third-party coverage is £10,000.

Additional attractions at the opening were demonstration runs on the as yet unfinished car track, and passenger hauling by E. T. A. Sims with his showman's engine described in the April 23rd issue of THE MODEL ENGINEER.

Before the chairman of the council opened the track, his wife, Mrs. N. P. Roberts was presented with a bouquet by Gillian, the four year-old daughter of vice-chairman I. C. Moxham. The flowers were grown in the garden of the society's founder and oldest member Mr. S. G. Underwood.



View of Penn Inn Halt, showing track mounted on concrete pylons



Two unusual and attractive models in bottles: the White Rabbit, and the Pied Piper, made by R. F. C. Bartley

General Models at the

NORTHERN MODELS EXHIBITION

REPORTED BY "NORTHERNER"

IT will be recalled that when I described F. H. Buckley's near-perfect M.G. car in an earlier article, it was mentioned that, according to a bystander, no fan should be fitted. Mr. Buckley now writes to say that this is correct, as he has taken the trouble to verify from the makers of the prototype. He states that the model was begun long before he was intimately acquainted with any breed of car, and he worked chiefly from a catalogue. This contained several photographs of various details, and a drawing of chassis and engine unit. This drawing is not too clear, and it is almost impossible to decipher just what is fitted between engine and radiator. Mr. Buckley interpreted it as a fan—"probably," he says, "because I believed that every car had a fan!" There were many breaks in production, due to R.A.F. service, and then he became the owner of a J2 M.G. for 18 months. This had no fan, but it did not occur to Mr. Buckley that the P-type had none either!

Exact?

The chassis was finished in 1948, and soon afterwards access was had during lunch-times to a P-type. After many hours spent in sketching and measuring-up, work was started on the body in earnest. Hardwood formers were carved out for the wings (20-gauge aluminium), scuttle (22-gauge copper), and body (22-gauge brass). But still the fan passed unnoticed! However, it will soon be removed, and then, I imagine, it will take a *real* Inspector Meticulous to find anything wrong.

Now, to change the subject, the cover-picture of THE MODEL ENGINEER of April 30th showed an old-world farmhouse kitchen, beautifully modelled by F. Slater, of Bury, and the model was, as usual, described on the Editorial page. I do not propose to include my own photograph of this work, since it practically duplicates the other, but one fact that was not mentioned was that Mr. Slater had spent about ten years on the job. It was started in an air-raid shelter, and carried on in many diverse places. By the way, the draughts-board which appears to be *on* the Queen Anne occasional table is actually inlaid into the top. This was a delightful model with a

A well-nigh perfect pair of duelling-pistols, made half full-size, by J. W. Thomas

particular appeal to the ladies and children.

Bottle Models

The same remark also applies to the very well executed models of the White Rabbit and the Pied Piper, placed in bottles by R. F. C. Bartley of Bristol. One is quite familiar with the " Sailor Sam " method of placing a clipper ship in a bottle, or with the " building up " method, but this exhibitor must have used an amazing combination of skill, patience, and ingenuity in building up these entertaining models. Apart from the figures themselves, which were quite all they should be, the backgrounds were well painted, and the detail was well thought out—note, for example, the flowers and the snail in the White Rabbit picture-model.

Duelling Pistols

We have previously noticed the magnificent model piano by H. A. J. Smith of Bexley Heath, which won two trophies and the " first " in its class. Second prize in this class was awarded to a pair of duelling-pistols, made to half-size by J. W. Thomas of Cardiff. These were in a velvet-lined wooden case, which was fitted with lock and key, and which also contained all the accessories. The latter included a powder flask which incorporated a device for measuring different charges of powder, a mould for casting the bullets, with sprue cutter, and a patch cutter or circular punch for cutting wads. Other equipment in the case were the cleaning-rods, a " worm " for withdrawing the charge, a supply of bullets, and an oil bottle. The workmanship and finish of this model—one might almost say group of models—was of the highest order. Query : is a firearms certificate necessary for the owner ?

A Model 24-pounder

Another " lethal weapon " was the ship's twenty-four pounder cannon of the early nineteenth century by N. Downing of Timperley. This model had been built more for " show " than for a realistic finish, as witness the high gloss on the barrel and the wheels, and on the woodwork. In these circumstances, other points of detail might have been better finished ; for example, the ends of the wire hooks on the blocks and tackle had been left as cut by the wire-cutting pliers, instead of being filed up, and the grain of the wood used both in the body of the cannon and in the " deck-planking " was too open and coarse. The cannon was featured on the cover of THE MODEL ENGINEER for May 7th last.

Some of the delightful animal models carved in pine by Ralph Woods

The hon. secretary of the N.A.M.E., Ralph Woods, of Heywood, Lancs, is a craftsman in many different media, and my last photograph shows some of his animal models, carved in pine. The work was admirably executed ; the various breeds of dogs were to proportion and each possessed the proper characteristics. Other work displayed by Mr. Woods included an ivory crucifix, and in contrast some amusing caricatures of well-known people, modelled in plasticine.

Conclusion

My final remarks on the Northern Models Exhibition would apply, I think, to every exhibition I have attended. In general, the work displayed was of a good standard; some was of a very high standard indeed. But there is still too much work spoiled in the finishing; with rough paint, with poor lettering, with occasional file-scratches not eliminated, with sharp corners buffed off in polishing. And last, but by no means least, with those ever-recurring countersunk screws !

A NAVAL OCCASION

DURING the first world war, the writer was a member of the crew of H.M.S. ———, a battleship of the " super dreadnought " type.

This ship was present at the battle of Jutland, and during the heaviest period of fighting it was struck by an enemy shell, which fortunately did not penetrate the armour plate, but left some fragments on the deck.

Three of these, about the size of a tennis ball, were picked up by one of the stokers who showed great pride in his find. This was on the day after the battle, when the excitement was at its highest.

One of the Petty Officers, wishing to obtain one of the " splinters " for a souvenir, asked the lucky finder how much money he would take for one. " Do you mean sell one," said the stoker rather indignantly, " Not likely, no white man's money could buy them. Them's going to stop in our family whatever happens."

A week or so later both stoker and Petty Officer met at the engineer's store. " Well," said the Petty Officer, " how's the shell splinters going on ? I suppose you have sent them home." " No," said the stoker, " I let Joe Ross have them for three tots of 'neaters' (neat rum) and he's promised me a drop more later on ! "—P. ROBINSON.

A geared hand-drive for the leadscrew

By K. N. Harris

SOME years ago there was published in THE MODEL ENGINEER an article of mine dealing with the reconditioning of a 90 mm. Boley screwcutting lathe, which once graced the toolroom of Kodak Ltd.; it was, in fact, the first precision lathe installed when that toolroom was started something over 25 years ago, and did about 17 years' work there, before it was given to me by the company.

Since then I have done quite a lot more work to it, such as fitting a multi-speed overhead gear with a series of milling, drilling, and grinding heads, providing dividing apparatus, and fitting the special hand feed to the leadscrew, which is the specific subject of this article.

The leadscrew in this lathe is housed in the middle of the bed, the top portion of which is solid, the interior being hollow, and open at the bottom. A sort of hammock-shaped casting is fastened to the saddle, and bridges the underside of the bed; this carries a clasp nut, which, incidentally, is fitted with a spring-operated quick-release, a most useful device.

The leadscrew was not fitted with any form of hand turning gear; I never came across a lathe of this class that was. However, for many jobs which the poor benighted amateur sometimes has to tackle on the lathe, some form of hand operating gear is at times most desirable, and I decided to make and fit the device illustrated in the accompanying drawings, by means of which the leadscrew can be turned direct, or by a simple single movement, at a reduced ratio of 50 to 1.

The device is fixed to the leadscrew as follows. A $\frac{7}{16}$ in. dia. hole was bored about 3 in. down the outer (right-hand) end of the leadscrew and the tail of the main spindle of the apparatus was made in the form of a split expanding mandrel, being expanded by a hardened taper-ended drawbolt and nut.

The form of gearing used is very old in principle, and a device of identical principle and very similar construction was used years ago by the late Geo. Adams on his round-bed lathe for an identical purpose.

The principle involved in obtaining the large reduction is very simple indeed, and consists in its essentials of having two wheels with *different numbers of teeth*, both gearing with a single pinion. "Hee, Hee!" says the "practical" man full of buck and beans, "you can't do a thing like that, it won't work!"

Sorry, but you can, and it does. Obviously, if you have two wheels of the same diameter, with differing numbers of teeth, the pitch of one or both must be wrong, or the tooth form must be faulty, and so, in fact, it is in this case.

The wheels used are of 20 d.p.; the fixed wheel has 50 teeth and the revolving wheel, which drives the leadscrew 49 teeth whilst the common pinion has 12 teeth.

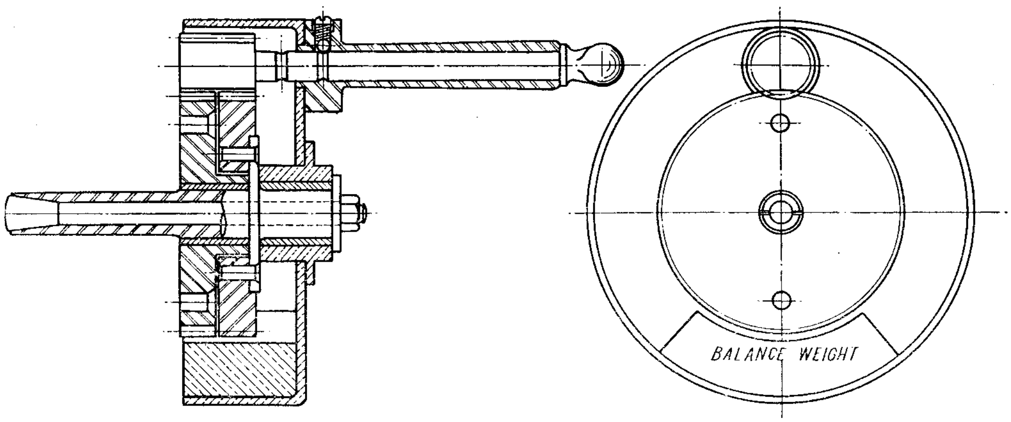
Here it might be opportune to point out that the number of teeth in the pinion has no effect whatever on the gear ratio, and whether it has 12 or 120 teeth, the ratio is unaffected; obviously, it is desirable to keep down the overall size, so a pinion with the minimum practical number of teeth, 12 in ordinary circumstances, was used.

The wheels are of identical outside diameter, which is that for wheels having $49\frac{1}{2}$ teeth (more raucous laughter from the "practical" man!).

This results in the error in tooth form being spread over both wheels, and the actual error itself is of the order of 0.0015 in. per tooth.

Where high speeds, or the transmission of considerable power is concerned, this form of gearing should not be used, but for such a purpose as is here in question, it is perfectly satisfactory.

It works as follows:—The 50-tooth wheel is bushed, the spindle being free to revolve within it,



General arrangement of a direct and reduction gear handfeed for a 90 mm. centre Boley lathe leadscrew

and the wheel itself is fastened to the end of the lathe bed and cannot rotate. Taking the apparatus with the pinion pushed in and gearing with both wheels, if the handle is turned one complete revolution, the pinion is moved 50 teeth; it is geared with the 49-tooth wheel and must, therefore, carry this forward one-fiftieth of a turn. If the 49-tooth wheel were fixed and the 50-tooth wheel fastened to the spindle, the apparatus would function in an identical manner, except that the spindle would revolve in the *opposite* direction to that of the handle. Where a right-hand thread leadscrew is used, this is the more convenient arrangement, it being usual in English lathes for clockwise rotation of a feed handle to produce motion away from the hand.

To operate directly, the knob on the end of the pinion spindle is pulled to the right, bringing the pinion out of gear with the fixed gearwheel and into contact with two little steel pegs which engage in tooth spaces and so prevent the pinion rotating; being now locked, the pinion carries round with it the spindle gear, and hence the leadscrew.

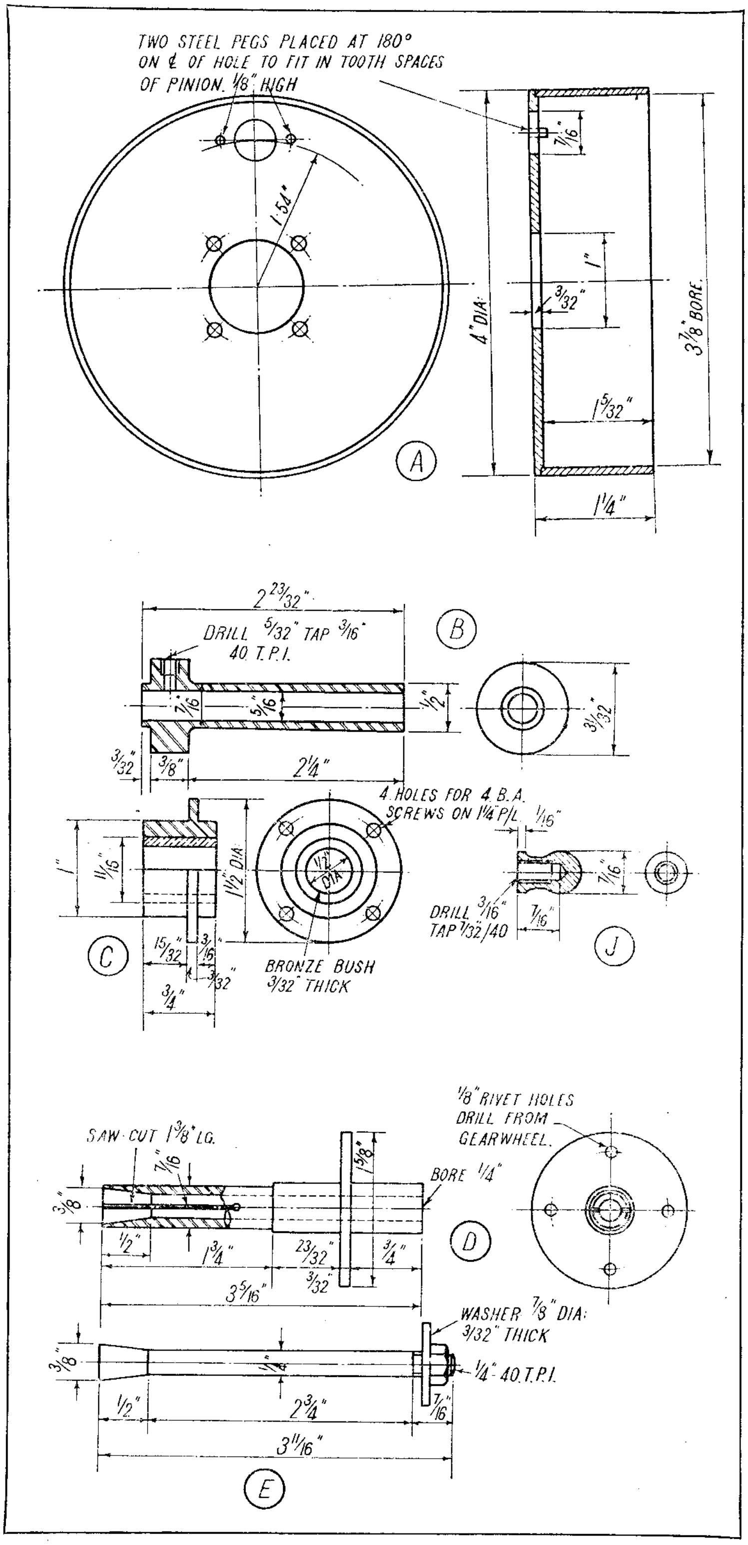
The drawing is pretty well self-explanatory and calls for little comment. Mild-steel was very largely used, as will be noted from the parts schedule; the gearcase was made up from an odd bit of steel tube, and a piece of mild-steel plate, silver-soldered together.

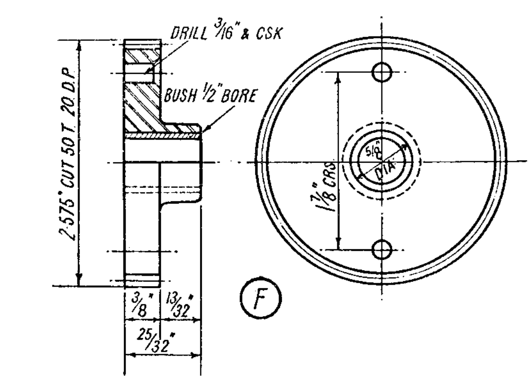
The sizes given would be suitable for any lathe from $3\frac{1}{2}$ in. to $4\frac{1}{2}$ in. centres or thereabouts, but could quite easily be varied to suit particular circumstances.

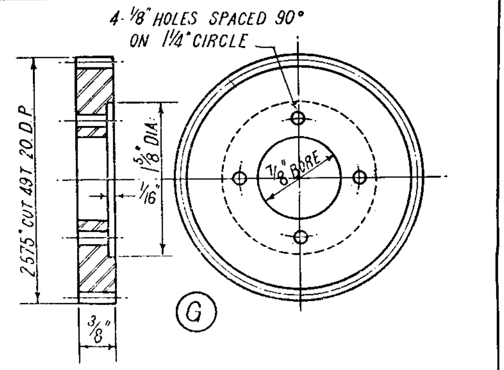
As a matter of fact, I made a device on this identical principle in the form of a special change-wheel as a part of a compound screwcutting train, using wheels of similar pitch and tooth number. This enables a very fine feed to be obtained, and is quite a useful little gadget.

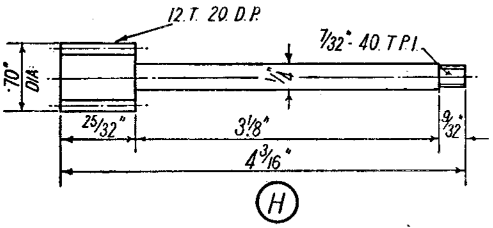
I should not recommend the use of this particular kind of gear with less than 40 teeth; of course, the larger the total number, the less error there is in tooth size. In all cases work out both wheel blank diameters to the half tooth between large and small, thus splitting the error between the two wheels.

Epicyclic forms of gearing are most fascinating things to study, and have a very wide range of practical application. There was a most excellent series of articles on them in Vol. 28 of THE MODEL ENGINEER; I have always felt that this type of gearing is ideal for a









SCHEDULE OF PARTS

PART	DESCRIPTION	MATL.	NO. REQD.
A	GEAR CASE	BRASS & STEEL	1
B	HANDLE	M.S.	1
C	CASE CENTRE	M.S.	1
D	SPINDLE	M.S.	1
E	ASSEMBLY BOLT	M.S.	1
F	FIXED GEARWHEEL	M.S.	1
G	DRIVEN GEARWHEEL	M.S.	1
H	PINION & SHAFT	M.S.	1
J	GEAR-CHANGE KNOB	BRASS	1
	BUSH FOR "F"	G.M.	1
	BUSH FOR "C"	G.M.	1
	BALANCE WEIGHT	BRASS	1

lathe back-gear (it has, of course, often been used on small high-grade lathes, such as the Pittler and the Adams round-bed lathe), for it can be simply enclosed, balanced and lubricated; it is extremely compact, and if well made, most efficient in action with a high degree of silence in running.

This gear, in principle, is identical with that used on the old Model T Ford gearbox, though there, of course, the teeth were of correct size and shape throughout.

The kind of work in which the device described becomes most valuable, is in the cutting of long pitch spirals, multi-start worms, etc.

The job for which mine was originally made, was the cutting of an engraved steel roller, to be used by a friend for making the genuine type of chequer plate with *raised* ribs and sunken diamonds, in contradistinction to the type used, to the detriment of many otherwise accurate models, where grooves are cut, leaving the diamonds proud. The actual chequer plates were made from soft annealed copper sheet fixed on a planing machine table with the roller carried on the cross-carriage. Once set up, plates can be turned out almost as fast as a politician can talk; and that is fast!

In all such cases, the mandrel has to be driven from the leadscrew, and with the device described, this can be done either by hand or, with a little ingenuity, by driving the outside of the case with a flat belt.

The leadscrew of this lathe is 5 mm. pitch (=0.197 in.); therefore, if the rim of the case is divided into 197 equal divisions, a movement of one division will move the saddle 1/1000 in., and at the first opportunity I intend to do this, using the dividing engine described in THE MODEL ENGINEER for December 18th, 1952. At the moment, I am in the throes of setting up a new workshop in my new home, and it is quite a task. The ability to use the lathe as a longitudinal ruling engine can be very useful, as, for instance, in graduating a tailstock barrel or a drilling machine quill.

I do not for a moment suggest that this little piece of apparatus is a necessity for every amateur lathe user; it certainly is not, but for those who have to tackle all sorts of odd jobs, or who at any rate like to be able to tackle them, it is most useful, and extends the range of work that can be taken in one's stride, rather than having to take time to make a special rig-up.

I like these fancy gadgets anyhow, and that is quite sufficient justification for my making them; they are not wanted every day, but when they are, they are most valuable; and, anyhow, one gets a lot of fun making them.

Optical Components

The articles on the construction of cameras and other optical instruments which have appeared in THE MODEL ENGINEER during recent months have aroused a great deal of interest among our readers, and many enquiries have been received regarding the supply of components such as lenses, mirrors, prisms, etc. We are therefore pleased to learn that the Alana Optical Co., Dunraven Street, Trading Estate, Bridgend, Glam, are in a position to supply many of these special items, and are also prepared to advise and assist readers with their problems in the design and construction of such apparatus.

IN THE WORKSHOP

BY DUPLEX

A LATHE MILLING ATTACHMENT

ALTHOUGH a lathe fitted with a milling attachment can hardly be expected to take the place of a milling machine when it comes to doing heavy machining, nevertheless, with this additional equipment, light milling, including gear cutting, can be quite accurately carried out in the lathe. An appliance of this kind, made in the workshop, has been in use for some years, but this has now been replaced by the present attachment of more robust construction and improved design.

The milling attachment described is made for bolting to the lathe cross-slide, and the milling spindle is then driven from the lathe overhead. With this arrangement, where the work is mounted in the mandrel chuck or between the lathe centres, the part can be indexed either by means of the lathe change wheels or by using a dividing head to rotate the lathe mandrel.

With the lathe so equipped, all ordinary milling operations can be carried out, as well as thread-milling and other varieties of helical milling. In addition, a milling fixture of this kind can be attached to a vertical-slide mounted on the lathe bed and, with the work secured to the lathe cross-slide, the set-up then becomes in essential respects equivalent to a light, vertical milling machine.

Although the machine described is entirely of built-up construction, it has been found amply rigid when taking moderately heavy cuts with either an end-mill or a circular cutter.

The actual construction would, however, be made easier by using iron castings for the larger components and, at the same time, the rigidity would be further increased.

The weakness sometimes found with this form of attachment is that the direct belt drive cannot transmit sufficient power at low spindle speeds for taking cuts of reasonable depth. However, this fault can be largely overcome by keeping the belt speed high and then

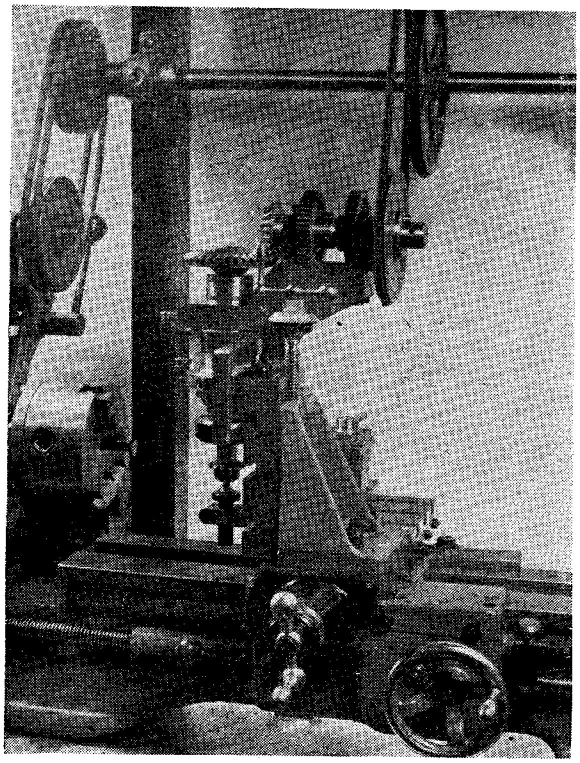


Fig. 1. The milling attachment mounted on the Myford M.L.7 lathe

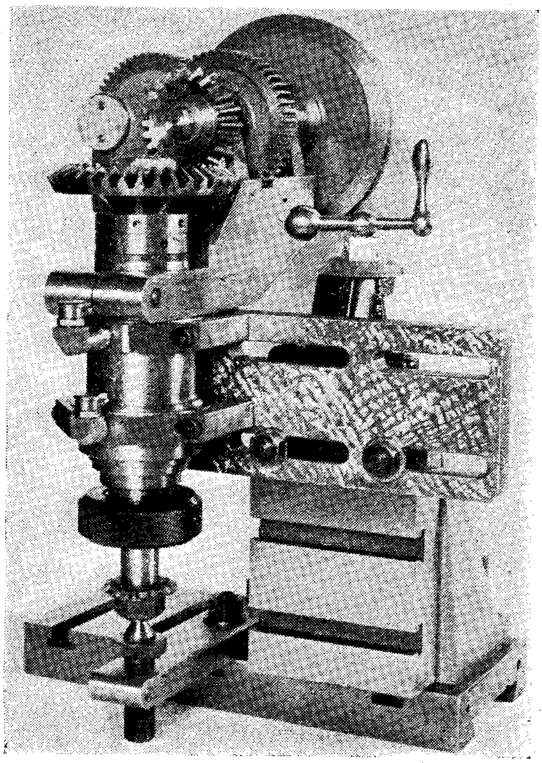
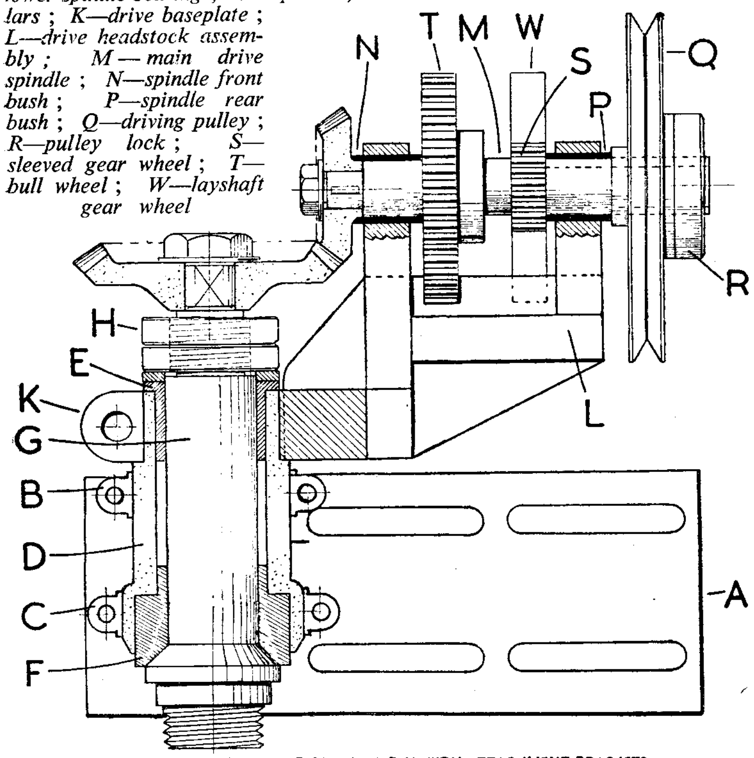


Fig. 2. Showing the method of mounting the attachment on the lathe cross-slide

Fig. 3. *A—the attachment plate ; B—the upper housing bracket ; C—lower housing bracket ; D—spindle housing ; E—upper spindle bearing ; F—lower spindle bearing ; G—spindle ; H—thrust collars ; K—drive baseplate ; L—drive headstock assembly ; M — main drive spindle ; N—spindle front bush ; P—spindle rear bush ; Q—driving pulley ; R—pulley lock ; S—sleeved gear wheel ; T—bull wheel ; W—layshaft gear wheel*



reducing the speed of the milling spindle by means of a back gear and a final bevel-gear drive.

The attachment illustrated was designed for a Myford ML7 lathe, but it has also been used on a lathe of 4 in. centre height fitted with an overhead drive. The forms of overhead driving gear for the lathe, described in previous articles, have been found quite satisfactory for use with the attachment, and they were, in fact, designed primarily for this purpose.

The Construction

As will be seen in the accompanying illustrations, the milling spindle with its driving gear is mounted on a baseplate (*A*) which serves for securing the attachment to the table of the standard vertical-slide supplied for the Myford lathe. Long slots are machined in the baseplate to afford a wide range of adjustment.

Mounting the Milling Spindle

Attached to the baseplate by Allen cap-screws are an upper and a lower bracket (*B*) and (*C*) for carrying the spindle housing (*D*). These brackets are made with loose caps so that the housing can be securely clamped in place.

The housing itself is made from a length of 2 in. diameter mild-steel

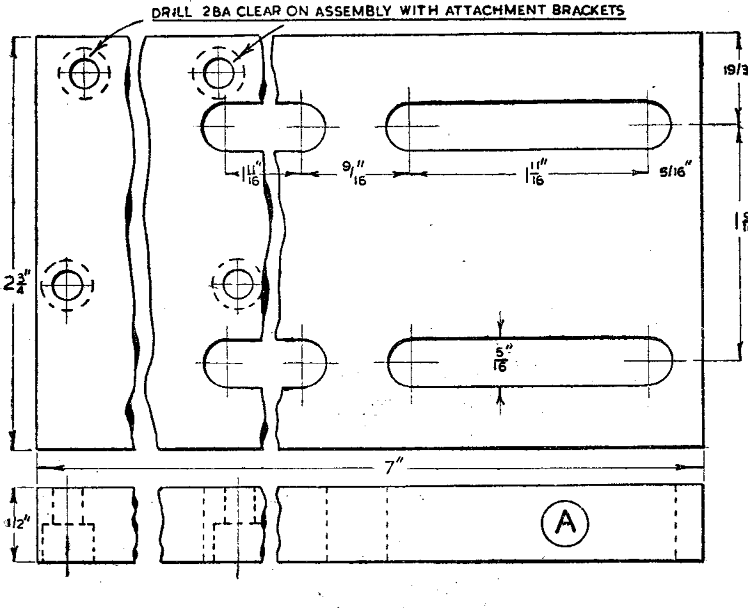
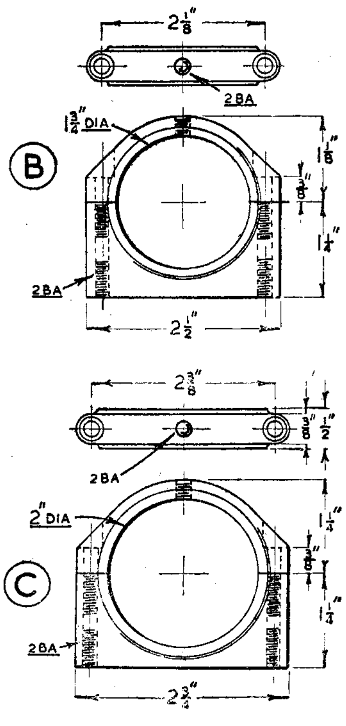


Fig. 4. The attachment plate



Right—Fig. 5. B—upper housing bracket ; C—lower housing bracket

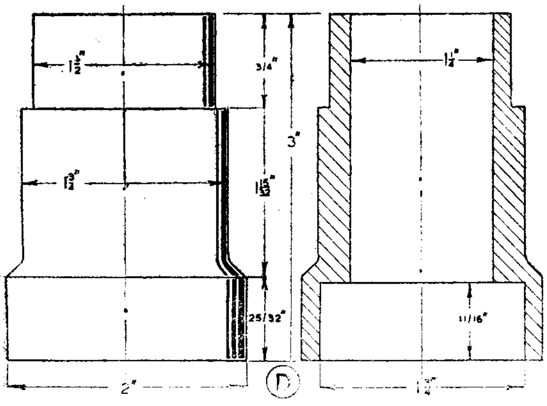


Fig. 6. The spindle housing

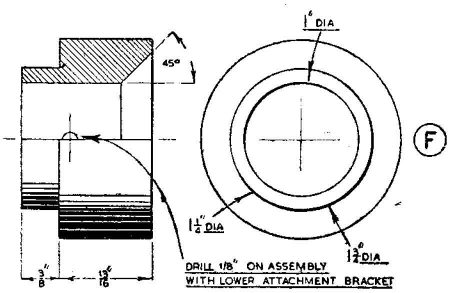


Fig. 7. Spindle upper bearing bush

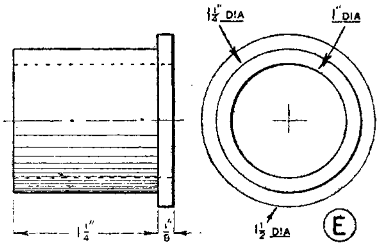


Fig. 8. Spindle lower bearing bush

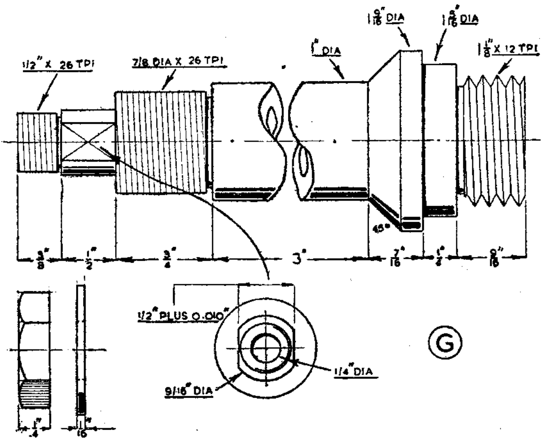


Fig. 9. The spindle

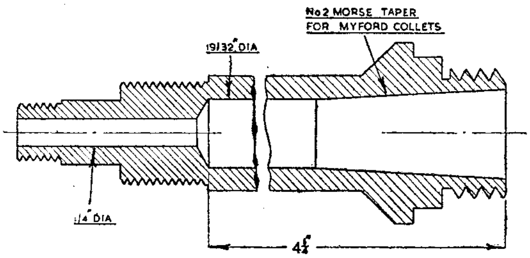


Fig. 10. The tapered spindle bore

bar and, after the outside has been turned to size, the part is centred in the four-jaw chuck for forming the central bore and for machining the seatings for both the upper and the lower bearing bushes (*E*) and (*F*).

The bushes were turned from centri-cast iron bar and are made a firm press-fit in their seatings. These bushes can be machined to a good finish on the bearing surfaces if a carbide-tipped tool is used and the lathe is run at high speed. The 45 deg. cone at the mouth of the lower bush was formed by setting over the top-slide with the aid of a protractor. To remove all tool-marks and to leave a high surface finish, the bores of the bushes should be lapped. The angular surface can be finished with an emery stick, but great care must be taken to preserve the true conical form of this important thrust-bearing.

The Spindle—(G)

To ensure good wearing qualities, the spindle was machined from an automobile side-shaft made of alloy-steel. The spindle is centre-drilled at both ends and then mounted between the lathe centres for screw-cutting the three threaded portions and turning the bearing surfaces. After the parallel part has been turned a thousandth-of-an-inch or so oversize, it is lapped to a close running-fit in the bearing bushes, and the contact between the coned surfaces is checked by applying marking paste. The angular thrust face can, if necessary, be corrected by light scraping and finished with an emery stick, but every care must be taken to maintain a true surface.

For forming the central bore, the spindle is mounted in the four-jaw chuck and accurately centred with the aid of the test indicator; the projecting end of the spindle should be supported in the fixed steady, and soft pad-pieces are used to save damaging the bearing surface. The $\frac{1}{4}$ in. diameter axial hole for the draw-spindle can now be bored with a long D-bit.

The Morse taper bore is roughed out by step-drilling, and then machined to size with a small boring bar carrying an inset cutter.

The shank of the hardened lathe centre will serve as a gauge for checking the taper and, if necessary, a standard reamer may be used for finishing the bore. As will be seen, the spindle nose is machined to correspond with that of the ML7 lathe; this is to enable the Myford mandrel collets to be used with the attachment, for accurately centring cutter arbors; in addition, Morse taper arbors can be securely held by means of the draw-spindle.

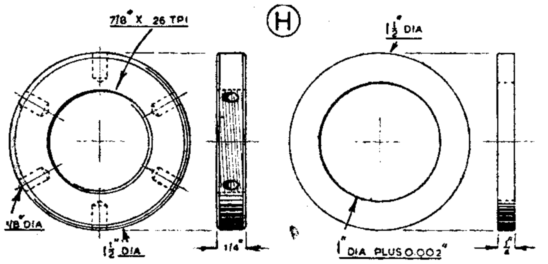


Fig. 11. The spindle thrust collars

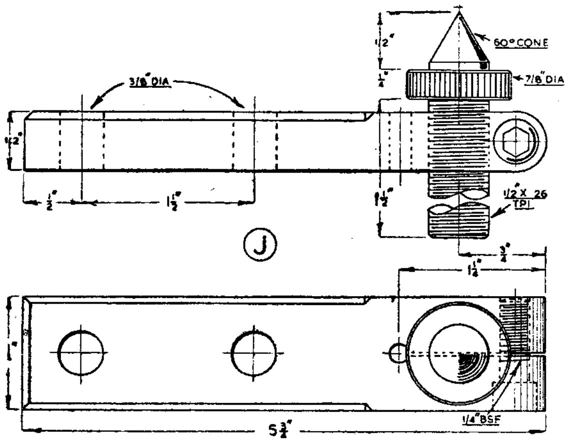


Fig. 12. The foot-step centre and baseplate

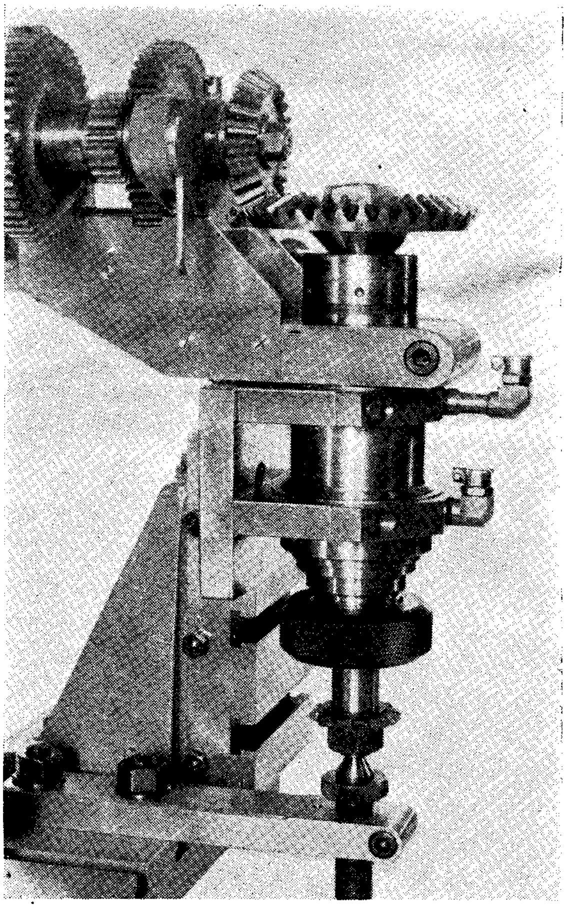


Fig. 13. The finished spindle assembly with its foot-step centre

If mandrel collets are to be used, the taper bore should be checked at this stage to make sure that these fittings will engage correctly. As the bevel crown-wheel fitted had its bore formed with two driving flats, the upper end of the spindle was machined to correspond. The reverse thrust on the spindle is taken by the two threaded collars (*H*); these are screwcut in the lathe to ensure an even bearing.

The Foot-step Centre—(J)

The rigidity of the attachment is increased by fitting a foot-step centre bearing to support the free end of the milling spindle; this also relieves the load on the spindle bearings for, as shown in Fig. 13, the point of support is quite close to the cutter itself. The small baseplate carrying the coned centre is bolted to one of the cross-slide T-slots, and the centre can then be readily set in correct alignment. The centre is made in one piece from a length of silver-steel and is finally hardened and tempered to a light straw colour, or mild-steel can be used for the fitting if it is afterwards case-hardened.

To ensure accuracy of alignment, the threads on both the mating parts were screwcut in the lathe. When the coned centre has been adjusted for height, it is securely clamped in place by tightening the Allen cap-screw to close the split end of the base mounting. This arrangement allows the centre to be quickly and accurately adjusted, and is preferable to that, sometimes used, where the centre is located by means of a single nut on each side of the housing.

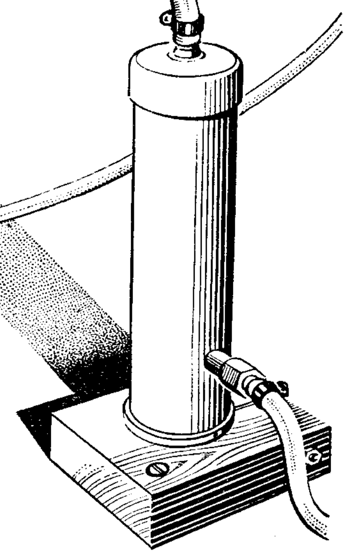
(To be continued)

PLYWOOD SHEETS

We have received for inspection a sample of the mahogany-faced resin-bonded plywood sheets now being advertised by Models and Supplies, Old Fore Street, Sidmouth, Devon. These are of excellent quality, measuring 48 in. by 24 in., with semicircular ends, $\frac{1}{2}$ in. thick and have many potential applications in connection with model engineering or other home crafts. Apart from yielding a useful amount of constructional timber, the sheets could be used in one piece for a baseboard of a miniature railway layout or architectural model They are very good value at the price quoted in our advertisement columns.

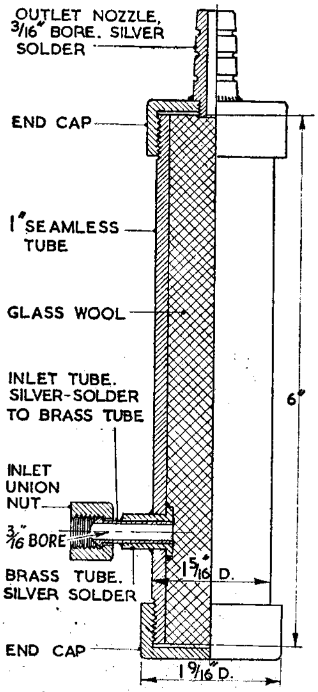
A useful AIR COMPRESSOR FILTER

By R. C. Collins



SOME readers who have purchased Government surplus compressors may not be aware that these machines were designed for a certain aircraft application in which a film of oil penetrating through the system is not undesirable. In the amateur's workshop the production of this oil mist or spray in the compressed air delivery line plays havoc with rubber hose, and precludes the effective use of the plant for such purposes as tyre inflation or paint spraying. It has been suggested that to minimise the inclusion of oil mist in the delivery line the supply of oil to the compressor bearings may be reduced by fitting a drip-feed system. While this procedure undoubtedly will assist matters, it is a moot point whether or not it is desirable, particularly in cases where the plant is going to be used for comparatively continuous periods.

In an effort to exclude this undesirable oil mist I have experimented with several types of filter, and the one now described has been found to be both simple and extremely satisfactory. It consists of a small cylinder containing fine glass wool which is placed between the compressor and the air receiver. The cylinder stands vertically, the compressed air enters the filter at the side of the bottom of the cylinder, passes through the glass wool and out through a delivery nozzle, screwed and silver-soldered into the top of the cylinder.



Materials

My filter, as will be seen from the illustration, consists of a 6 in. seamless pipe, screwed at both ends 1 in. B.S.P. Two caps were machined and threaded to fit the ends of the pipe. The inlet union consists of a brass tube machined with a flange which butts against the inside of the cylinder and is silver-soldered *in situ*. The inlet pipe carrying a union nut is silver-soldered into the brass tube and is connected to the compressor by flexible tubing. The bore of both inlet and outlet nozzles is $\frac{3}{16}$ in.

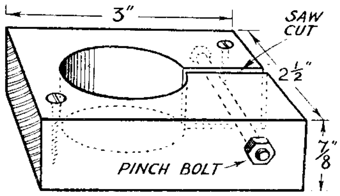
The glass wool, which is the heart of the system, was obtained from Versil Ltd. This is spun glass, each strand of which measures about 0.001 in. diameter. I make the usual disclaimer *re* Versil. I have no financial interest in the company but they are insulation contractors whose business is carried on at Raynor Mills, Cleckheaton. This glass wool was lightly packed into the cylinder and the end caps were screwed tightly on to the extremities of the cylinder after a liberal smear of jointing compound had been placed on the threads.

In cases where high pressures are required from the air receiver, it would be advisable to braze the caps in position as well, but I purposely avoided doing this, as at infrequent intervals the bottom cap can be unscrewed and the accumulation of oil from the compressor drained from it.

In conclusion, I would offer a word of warning against substituting cotton wool for glass wool. Glass wool is, of course, non-absorbent, whereas, if cotton wool is used, the tendency is for the cotton wool, in due course, to become a sodden mass which may effectively block the outlet nozzle and cause an explosion, particularly if the compressor is not fitted with a relief-valve.

Left—Part sectional elevation of filter. Tube from compressor is fitted to lower nozzle, whilst the tube to the receiver is attached to nozzle at top

Below—Wooden base for mounting the filter



TWIN SISTERS

by J. I. AUSTEN-WALTON

NOW that I am able to reproduce the awaited drawing of the ashpan and firehole door, there are one or two additional comments to make. First of all, as it was pointed out, my own ashpan was of welded construction, by far the most satisfactory way of doing the job ; but relatively few builders have the necessary equipment, so I have had to think up a method of making the ashpan without undue complication.

You will see, when examining the drawing, that the two shaped sides are each single pieces of sheet metal with double right-angled bends and long sweeping parts, leaning inwards. The double right-angles serve two purposes ; the first or uppermost bends give attachment flanges for fixing directly to the underside of the boiler foundation ring, the attachment being in the form of two short set-bolts on each side. There are dimensions given for the spacing of these bolts, but they are not in any way critical ; put them as far apart as possible to give the best and greatest support, but see that you avoid drilling at a place where a cross rivet has been put in during boiler construction. Also, see that the drilled and tapped holes do not go right through the foundation ring, or you will be bothered with leakage in the future, and make the bolts from some material that will not rust. Try to use something a bit better than ordinary brass for these.

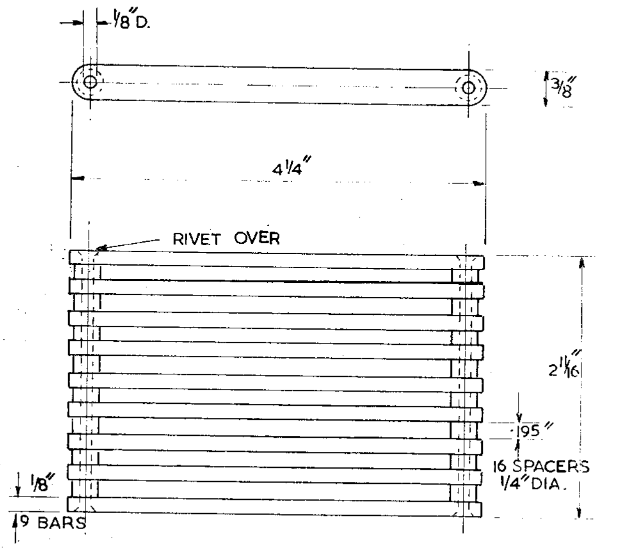
The second right-angle bend serves to support the grate itself. The dimensions given should enable the grate to slide in and out quite freely ; it does not matter in the least if the fit of the grate is quite sloppy ; there will be nothing to lose except a little ash, and you want to lose that in any case. It *is* important to make sure that the grate can be drawn back quickly and easily in an emergency, and this is done by putting the pricker through the firehole door, jabbing it down smartly when it will stick between the bars, and drawing it back in one simple movement. This movement produces a large " holiday " immediately in the front of the firebox (about $1\frac{1}{2}$ in. wide) through which most of the fire will fall ; anything remaining can then be shoved over the edge with the rake or the pricker itself. I know of no quicker way of getting rid of an unwanted fire in the shortest space of time. Although this second right-angle bend is drawn as such, it could, with advantage, be left on the obtuse (or greater than right-angle) side, so that the grate is supported only by its extreme outer edges.

My advice to you is to make up the two sides more or less complete, bolting them on to the foundation ring first of all. Bend the two parts so that they will just miss the tops of the axleboxes, pipes and horns inside the frames. Determine by measurement or by trial, the exact amount of arch required over the axle. There must be clearance here, but there is no point in providing more than is needed to miss the axle and axleboxes when the latter are hard up to the top of the horns. The drawing should be correct in this respect, but I mention this because your job may vary slightly from mine.

Once you have obtained the correct shape and setting for the side plates, and have cut these out, refer once more to the drawing. There are two end plates to make, shown as flanged and riveted to the side members. If you were welding the parts together, there would be no need for the flanges ; this also applies to Sifbronzing the assembly. Note that the front plate starts 1 in. from the bottom, and goes right up to the top of the unit, or level with the front section of the foundation ring. Flanging this all the way past the two double bends would be a formidable job for anyone less than a sheet-metal worker or coppersmith, and so you are allowed to do this in two parts—two simple flanges on the " Y " part, and two short flanges or tabs, enough to take one rivet, on the straight part immediately after the first bend. The back plate is much simpler ; starting $\frac{3}{8}$ in. from the bottom, it terminates level with the bend forming the sliding channel for the grate. It is, in other words, the slot through which the grate slides when required to do so.

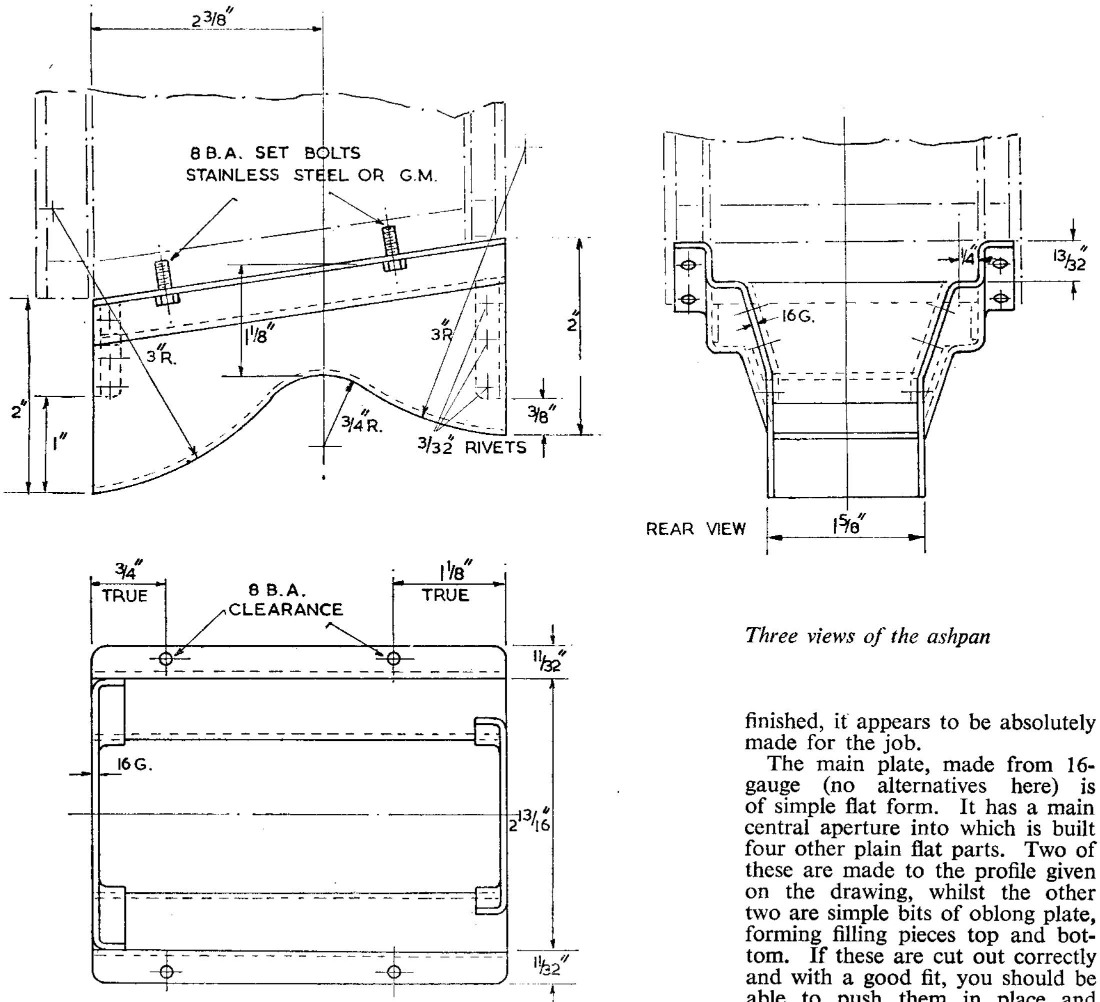
There is no form of fixing shown for the bottom of the ashpan, but there is no reason why this sheet should not be cut out with about three tabs on each side, afterwards bent up and riveted to the sides. Welding or Sifbronzing certainly makes a much neater job, and I hope those who can get the job done in this way, will make the necessary efforts.

The grate is as simple as anything



The grate

Continued from page 596, *May* 14, 1953.



Three views of the ashpan

can be—just a number of straight strips, with $\frac{1}{8}$ in. dia. rods at each end, and plain spacers turned up in mass-production style. It is surprising how critical the *length* of the spacers can be; imagine a few thous. plus or minus on each one, and calculate the cumulative extra width when finished; it might easily be as much as $\frac{1}{8}$ in. too great or too little in finished width. A dimension is given, however, and anything within a $\frac{1}{16}$ in. of that would fill the bill.

There is just one correction or alteration you might have to make, and then only if you use flanged plates for the front and back of the ashpan. These flanges might interfere with the full forward position of the grate by fouling it on the two sides. The obvious remedy is to file a couple of flats on the outer grate bar ends.

Finally, the gauge of metal for the ashpan throughout, is given as $\frac{1}{16}$ in., or 16-gauge. This could safely be reduced to 18- or even 20-gauge, especially if a non-rusting metal is used.

The prototype is fitted with the normal linked sliding doors which, if made truly to scale would be far too small for practical use. Increasing their size for normal track working would bring about serious encroachment on valuable space on either side, necessitating alterations to the run of pipes down the backhead. This I wished to avoid at all costs, and seeing that the truly scale door was out of the question in any case, I chose the drop type door. It was not a hurried decision, and I spent some time considering the merits—utilitarian and visual—of the remaining alternatives. The drop type door won, hands down, and now it is finished, it appears to be absolutely made for the job.

The main plate, made from 16-gauge (no alternatives here) is of simple flat form. It has a main central aperture into which is built four other plain flat parts. Two of these are made to the profile given on the drawing, whilst the other two are simple bits of oblong plate, forming filling pieces top and bottom. If these are cut out correctly and with a good fit, you should be able to push them in place and using a rough, temporary clamp over the two shaped side plates, hold everything together whilst brazing or silver-soldering the assembly. I always keep some old toolmakers' clamps, usually those that have become bent or damaged during their long and useful life, for purposes such as these. There are two pairs on the bench at this moment that have been made red hot dozens of times, and still they give good service; the only thing I have not yet done, is to braze either of them to the actual job—perhaps that will come some day. But, to revert to the door; at this stage, leave out the two holes in the side plates that take the main hinge pin, as they are best drilled from the actual door part, later on.

The door itself is just a plain plate having two tabs bent back on each side. Leave the final shaping of the

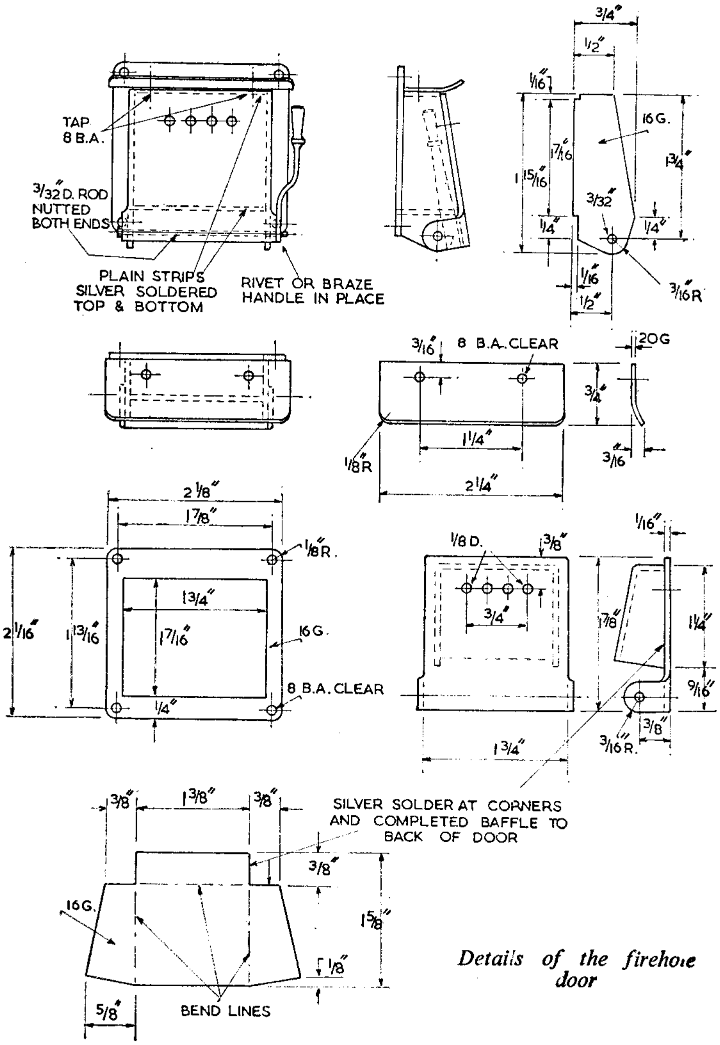
tabs until the holes are drilled and the door fitted. On the back of the door is brazed a baffle, bent up from the blank form shown. The position of this is not critical, but see that its position allows it to enter the door frame when on the swing. The bottom or open portion should slope upwards and inwards towards the firehole, so that, when the door is in the closed position, air, entering the top row of four holes in the door itself will pass down inside the baffle and still have room to escape underneath. The baffle is brazed in position; the bent-together parts of the baffle plate should be treated with brazing at the same heat, and the whole lot cleaned up together.

If the completed door is now carefully positioned in the frame, and clamped in place firmly, the hinge bar holes may be transferred through the tabs and frame sides, jig fashion. Now finish off the tabs to a nice clean profile, and set about making the operating handle.

The shape and position of the handle is my own choice, but there is no reason why you should not have a simple loop or draw type handle on the door itself—one often sees this style. In point of fact, the operating handle *should* be on the right or fireman's side, especially in such a small cab where there is none too much room for him and the driver to keep out of each other's way. I find the right-hand side for the handle most convenient when seated behind the engine, and the door, when fully lowered, sits flat on the deck, its baffle providing a most useful guide for the coal shovel, coming conveniently dead level with the inside plate of the door frame.

Next, we have a thinner plate, forming a kind of shelf or mantelpiece over the fireplace! It is fixed by two 8-B.A. set-bolts that pass through the shelf and into two tapped holes in the door frame. Do not bother to make finished bolts here, because, later on, a combined sanding and blower valve unit picks up the same bolts. Once more, this valve unit is placed exactly as on the prototype, and we have no difficulty in following normal practice. A recent MODEL ENGINEER cover picture shows this quite clearly, the right-hand control being the blower valve, and the left-hand the sanding valve.

The final assembling deed is to make and fix the hinge bolt. Its making needs no description, but you might leave enough thread to allow you to tighten the nut until the door is stiff enough in action to stay in any desired position; if it



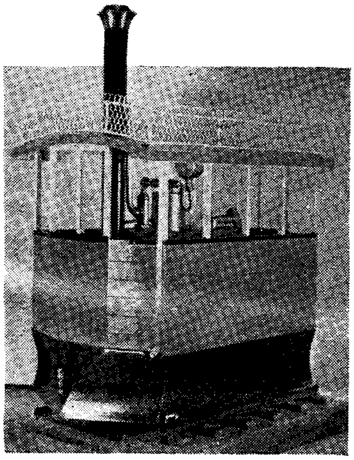
Details of the firehole door

will do this, the oven door type has absolutely no advantage over it.

You may encounter just one snag in the fitting of the door assembly. You may remember when the boiler was built, there were four blind bushes installed for through bolts or tapped sleeves, according to taste. In either case, these bushes may present slightly raised heads, preventing the door unit fitting closely to the backhead. In this event, take a piece of $\frac{1}{16}$ in. Hallite, punching out four holes to pass over the heads of the bushes. Cut out the remainder, forming a gasket for the door to sit on, and you will find everything will fit snugly to the boiler.

Just for general neatness, I suggest you give the ashpan unit a coat of dull black. Unless a stove enamel is used, practically anything will burn off in time. This calls to mind the ashpan fitted to *Centaur*; like practically everything else, it is made from stainless steel, and the highly polished variety at that. It happened to be the only kind then obtainable in the gauge needed, and at the time there seemed to be no possible objection to its use for such a purpose. During the last four years, people have often commented on the rather bright glow that comes from under the firebox, and I have to tell them that it is only the reflected light, coming from a veritable "Hall of mirrors" inside. Once during a shopping bout, I had the ashpan out and painted it a

(*Continued on page* 746)



"*Puffing Billy*"

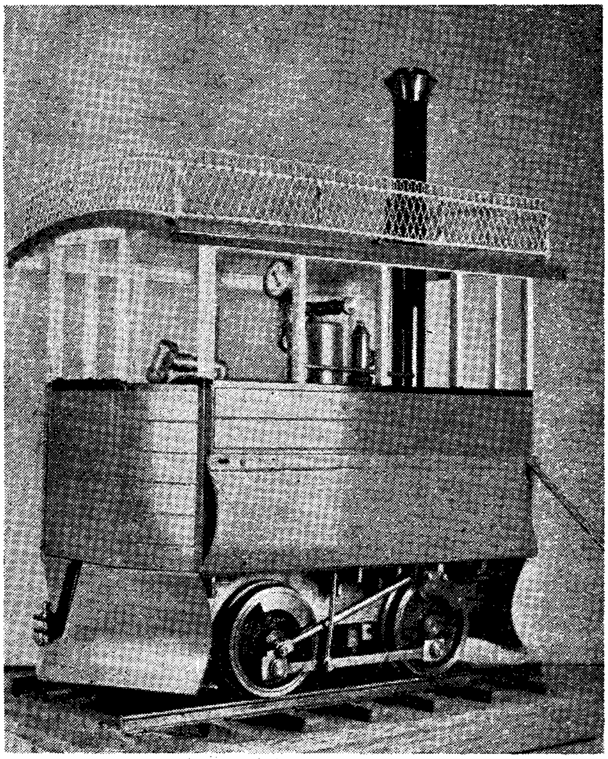
A STEAM TRAMWAY ENGINE

By J. Caverhill (Christchurch, New Zealand)

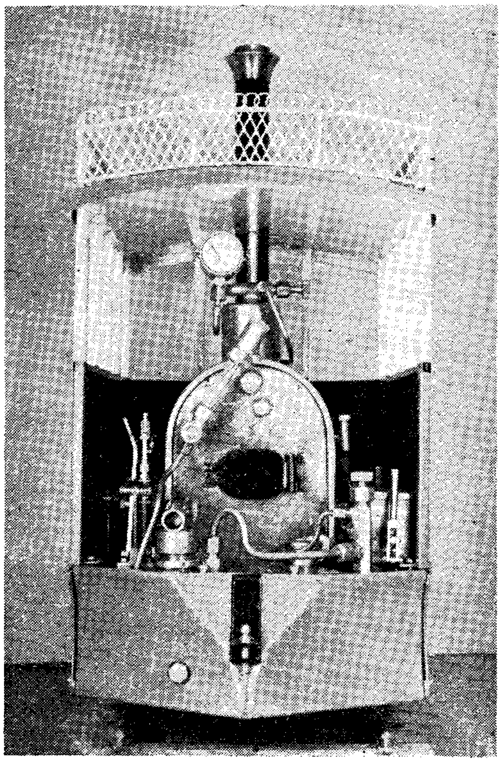
THESE steam street tramway engines, which we called "Puffing Billys" as children, have always fascinated me since childhood. Originally made by Kitsen & Co., of Leeds, for the Christchurch (New Zealand) tramways, they were used in the streets of this town about the years 1884-1905—the years between horse trams and the advent of the electric tram. As Christchurch is very flat, these engines used to haul trains of up to five double-deck, 4-wheeled trailers that had originally been horse-drawn rolling stock. A point that always made me wonder was how the driver ever managed to stop such a load, as the only brakes were on the engine, and these are lever-operated much the same as a motor vehicle hand-brake. When the remaining engine ventures out on the streets nowadays, an extra man rides on one trailer to use its hand brake as extra stopping power.

During my childhood up to 1930, these engines were used hauling ballast for track repairs and with many double-deck trailers taking school children to picnics at the seaside. The Transport Board still has one engine in good order, and it is still run on special occasions in Christchurch, together with some of the original rolling stock that has been kept in repair for this use.

The model shown in the photographs is ¾-in. scale, 3½-in. gauge, and is the result of a number of years' intermittent work. The only drawing available was a photograph of a drawing of the valve-gear and motions that had been published in *The Engineer* of 1883. However, the writer had access to the engines themselves; there were three when the model was started, but only one is left now. Also available at the time was the frame of a dismantled engine.



The engine with the body side-plate up



A view on the footplate

From this source, drawings were made, covering the main proportions, but I must confess, that a lot of detail parts were made to suit without drawings; also, certain parts were made to "L.B.S.C.'s" "words and music" so that the model could be made a working model. However, the small size of the boiler, 2½ in. diameter, 5½ in. long with a grate 1¾ in. square, makes for difficulties of steaming, and although the writer has ridden behind it on a level track, due to the aforesaid difficulties, I would not say it was a great success.

If anyone has ideas of constructing such a model, please take the advice of one who has found out the hard way, and make it 5-in. gauge or even 7¼ in., because in 3½-in. gauge it is a watch-making job.

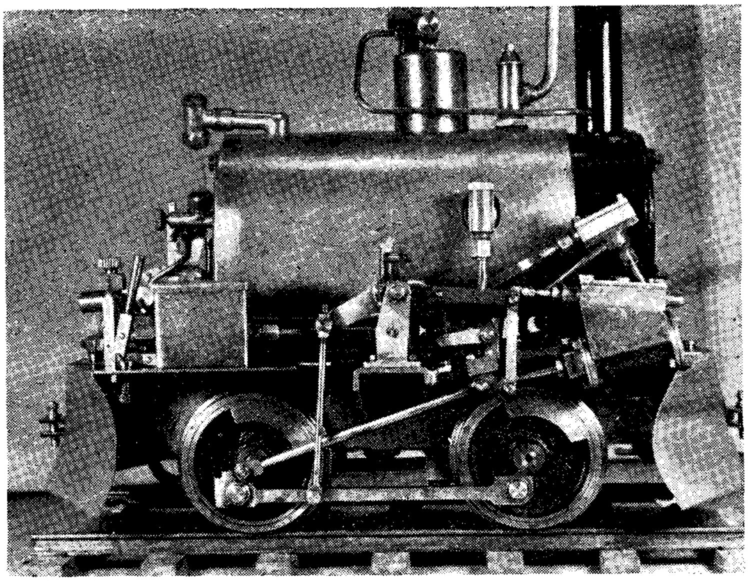
Perhaps I had better give some dimensions for the interest of readers: Cylinders—One ½-in. bore and ¾-in. stroke. Driving wheels—1¾ in. diameter. Overall length—9 in. Width—5¼ in. Height to top of chimney—11 in. Wheel arrangement—0-4-0, with axle-driven feed-pump in the front feed-tank, that is between the frames over the leading axle. The hand feed-pump is on the footplate together with the by-pass valve, as can be seen in one of the photographs.

One point of interest is that, due to the narrow over-all width of tramway rolling stock of 4 ft. 8½-in. gauge, such as these engines are, not being as wide as railway stock of the same gauge, the connecting-rod instead of being on the outside of the side-rod, is on top of the side-rod.

Although I have not fitted brakes, those on the original were hand-brakes; the brake lever was on the quadrant frame beside the reversing lever and moved forward to open the regulator and backwards to apply the brakes. The regulator can be seen on the side of the smoke-box, the brakes had two shoes on each rear wheel and one on each leading wheel; brake and reversing lever were duplicated at the front end of the engine.

Some points on construction may be of interest; the frames are orthodox plate frames with hornways for axle boxes, but it has a steel plate or deck right over the top with a hole for the firebox. Over the leading axle was a feed-water tank containing an atmospheric condenser and another feed-tank behind the firebox; also, there was a condenser on the roof, but I have not fitted either condenser to the model.

The valve-gear and cylinders were fairly straightforward, although rather small; and by the way, all the steel



A view of the works

parts in the valve-gear and motions are made of annealed spring steel, which I recommend, as it does not clog the files and it is stronger than mild-steel.

The boiler gave no trouble, only one small leak on the outside of the backhead, which was lucky. The big problem was the body, the "boards" for the sides being brass plates with suitable grooves machined to imitate boards; framework is of strips cut from 3/16-in. brass, but the big headache was the wire-work which consists of over 250 pieces of 28-gauge wire, each of which had to be soldered four times in attaching it to the frame.

In conclusion, I must thank the past and present workshop superintendents of the Christchurch Transport Board for their assistance in this project, and L. Walcott-Woods for the photographs.

TWIN SISTERS

(*Continued from page* 744)

dull black, but the heat and scouring action of the ashes and bits of clinker, soon restored it to its original pristine brilliance. This is one of perhaps the only two disadvantages of stainless steel that I have yet encountered. The other one is its inability to "blue" in heat treatment—a feature I would have welcomed on more than one occasion, merely on the score of appearances for certain jobs. The door unit should also be in a dull black, with just the hand portion of the operating handle left bright.

And that completes the further description of the drawing matter for this week, so we can talk about something else.

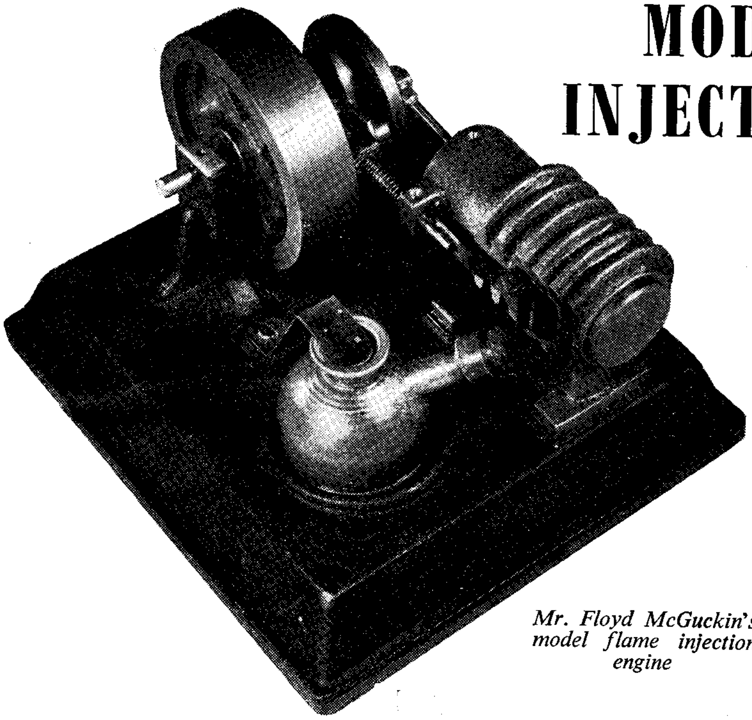
Having the chance to pore over the relative beauties of some 176 small locomotives, all under one roof, does not often come my way. The opportunity came to me recently when I was invited by the Birmingham Society to go up as their guest, to take "Twin Sisters" and to assist in the judging of the competition section of their exhibition at Bingley Hall.

I might easily cover several pages dealing with the many points of interest that cropped up in the locomotive section alone, and in which I spent the entire available time in between certain other pleasurable duties.

There was, however, one locomotive that made a particular appeal, not only to me but to everyone else who, sooner or later, found himself unable to tear himself away from it. This was a 5-in. gauge, 4-4-0, three-cylinder Midland Compound, in course of construction by Mr. A. J. Webb, of the Birmingham Society. He told me it was being built from Works drawings, and it certainly looked like it—*real* locomotive stuff and not just something resembling the prototype.

(*To be continued*)

MODEL FLAME INJECTION ENGINES

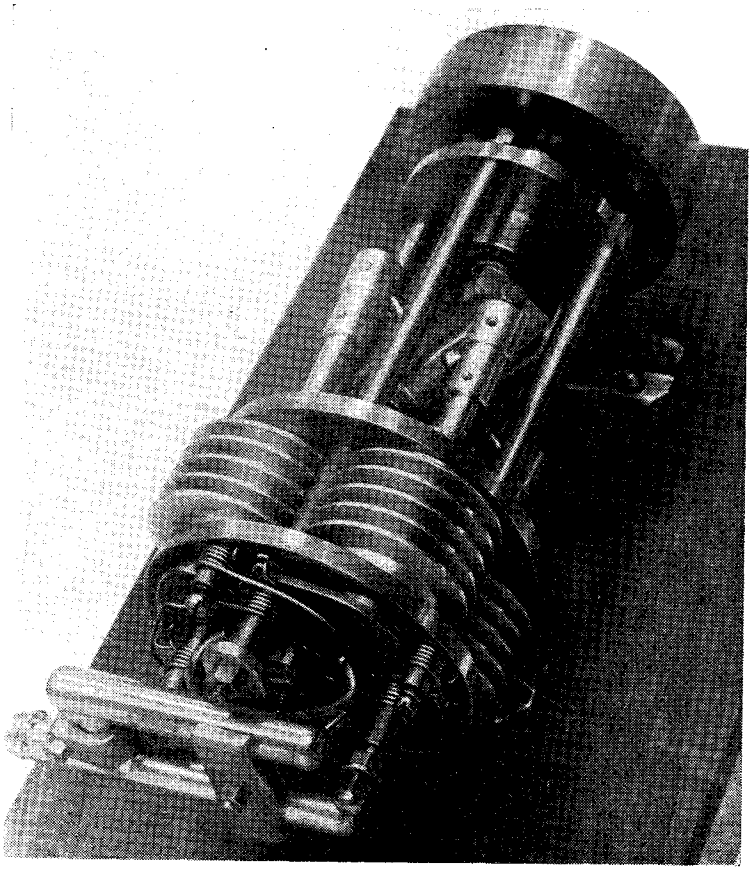


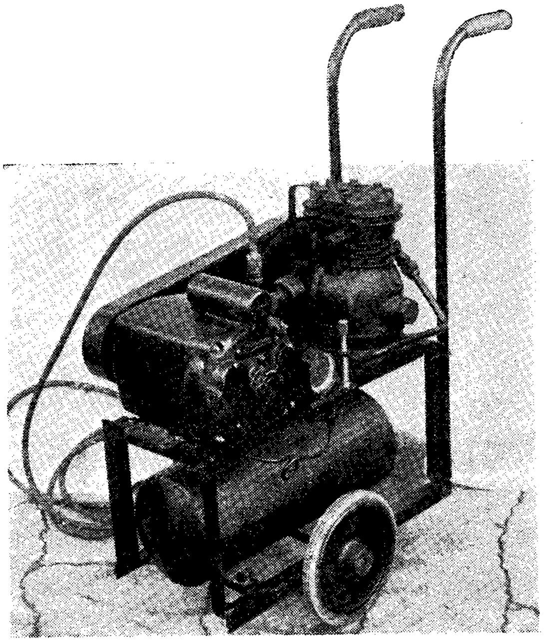
Mr. Floyd McGuckin's model flame injection engine

MR. HARRY WALTON, of White Plains, New York, has sent us a photograph of a very interesting engine constructed by Mr. Floyd McGuckin. It represents one of the many varieties of heat engine which has enjoyed a certain amount of popularity in the past, and has been vaguely defined as a "vacuum" or "atmospheric" engine—obviously contradictory terms—but is perhaps most correctly described as a form of hot-air engine. The actual motive power is derived from the heat of a flame, in this case produced by a small spirit lamp, which plays through a port in the cylinder wall so that the air inside is heated and thereby caused to expand. This port is kept open during the outward stroke of the piston, but at or near the bottom dead centre, is closed by the action of a simple slide-valve, operated by a cam on the engine shaft. On isolation from the source of heat, the contents of the cylinder cool to some extent and contract, thereby producing a partial vacuum which is utilised to produce the (inward) power stroke.

In common with most other forms of hot-air engines, the difference of pressure which can be produced by this method is very limited, and thus the power which can be obtained from an engine of a given size is small as compared with other types of prime movers; in nearly all cases the thermal efficiency is also low. They have, however, the merit of extreme simplicity, and can be usefully employed on light duties; their reliability for such work and freedom from mechanical troubles, has often been a recommendation to users. Recent contributors to THE MODEL ENGINEER, and including the late "B.C.J.," have speculated whether the hot-air engine may yet return, in an improved form, as a competitor to other modern means of motive power.

A very interesting multi-cylinder flame injection engine, having an axial cylinder arrangement, with the pistons operating on a form of swashplate or Z-crank, was exhibited at the "M.E." Exhibition in 1950, by Mr. R. J. Harrison, of Southborough. (See photograph below.)





A PORTABLE COMPRESSOR UNIT

By D. Churm

The portabe compressor unit ready for use in Mr. Churn's workshop

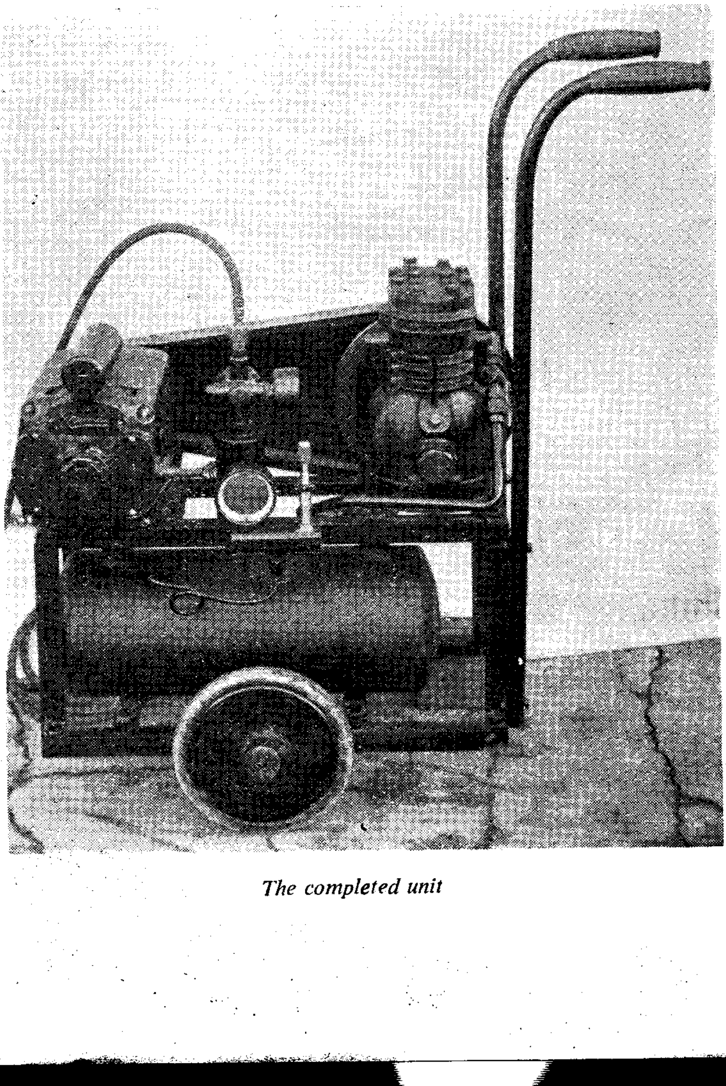
THE following notes concern a compressor unit, which I have made up for my workshop; some of the parts were bought second-hand and adapted as follows :

First, to deal with the compressor itself, this is a standard "Prestcold" model No. 25, which I bought second-hand, and had seen service before in a refrigerator. It has two cylinders just under $1\frac{1}{2}$ in. diameter giving an output of 2.8 cu. ft., and will pump up to 180 lb. pressure. This refrigerator-type of compressor usually runs at about 300 to 400 r.p.m., when used in refrigerators, etc., but they can be run, as does mine, at 700 r.p.m. without any sign of trouble at all. At this speed, the output is stepped up quite a lot, but if increased any more, very little is gained, and of course, wear and tear on the working parts is further increased, apart from the extra work put on the electric motor. My unit is driven by a 1/3rd h.p. motor.

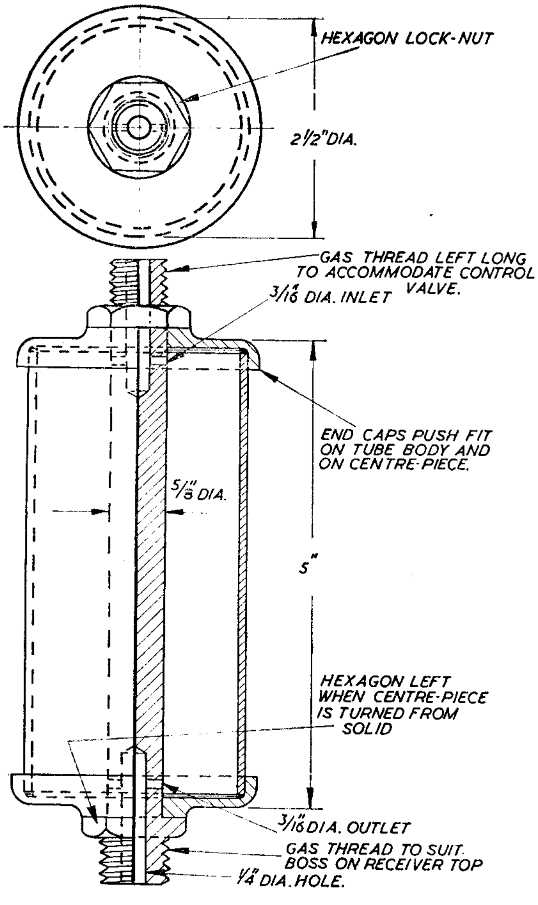
Now as regards what this type of compressor will do in the way of work.

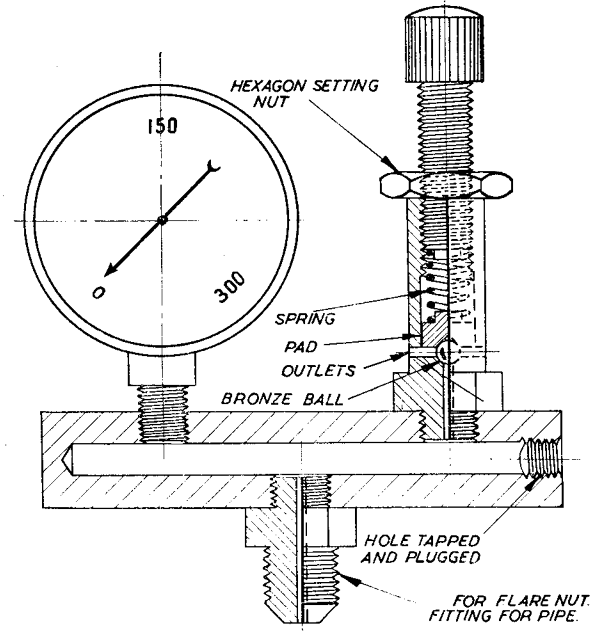
The first time it was used after completion was for our club exhibition at Llandudno last year, which was on for two days, and it ran non-stop throughout this period, raising steam for the locomotives when required, and supplying the working models with air; it managed to keep going about six models of different kinds and sizes, one $3\frac{1}{2}$-in. gauge chassis, one large traction engine driving a combine harvester, and other marine-type engines from $\frac{1}{4}$-in. bore to 1 in. This was about its limit as regards output for that sort of job; as it was, all the models were just ticking over nicely.

The next thing that was tried was spraying paint, and the following will no doubt give some idea what to expect if it is intended to use one of these ex-refrigerator compressors for this purpose. First, the standard type of spray-gun as used by garages and industry is rather large, as these require around 5 to 8 cu. ft. of air for spraying. You can use one of these by building up a good pressure of anything from 100 lb. to 150 lb.



The completed unit





Details of safety-valve and pressure-gauge mounting. (Not to scale)

Left—Part sectional view of the air dryer (not to scale). Not shown—"Hallite" packing washers fitted between end cap faces and end faces of tube body

and with the compressor still running, you will be able to give, say, a car door one coat before the pressure drops too low for efficient spraying. I sprayed the unit itself in this manner with black cellulose, and even though it kept spraying at a low pressure of only 10 lb. on the gauge, I would not recommend it for anyone doing a job such as a car or pram, etc., where a nice even finish is required.

The MODEL ENGINEER spray-gun, which had been made up by our club secretary, was also tried out, and found to be very satisfactory owing to its small size and low consumption of air; it was no trouble to do continuous spraying. I have also tried a commercially made gun, loaned to me by a friend, which was about half the size of a standard gun as used in industry. I do not know the exact figure of air required, but I think it must be about 3 cu. ft., as it was so well suited to my unit, and a constant pressure was nicely kept up. The use of small guns with a unit of this type is fine for small work such as is undertaken by the average model engineer, but the only drawback is the small capacity of the paint containers, and so only small areas can be tackled at one filling. This point is more important when dealing with cellulose, as it is desirable to keep a wet edge of cellulose as you spray along the work.

I have fitted two pressure gauges, as can be seen on the photograph, one is taken direct from the air-receiver to indicate the tank pressure, and the other is fitted to one of the three outlets on the control-valve, which is mounted directly on the end of the air-dryer. This gauge, which in the photographs faces towards the compressor, gives the working pressure in the air-line or gun; the pressure is controlled by a diaphragm valve, and can be adjusted as required by turning a screw which is fitted on the side of the valve. This control-valve is a commercial one, and had nothing done to it except renovating, and countless coats of paint, etc., removed.

The air-dryer, of which I have made a drawing, is essential for spray work, for it removes a large proportion of moisture in the air; the air enters at the bottom of the dryer and passes through felt rings tightly fitted inside, and passes out through the top to the control-valve. The body was made from a piece of $2\frac{1}{2}$ in. diameter copper tube, and the ends and centre-piece were made in brass. I have not fitted a drain plug on the dryer, because I have one fitted on the receiver, directly below, on the bottom side, so any water collected can run back and be easily emptied. I could not buy felt rings the size I required, so I made them out of some $\frac{1}{4}$ in. thick felt that had done service in a packing case. I punched them out on a piece of wood by making a punch out of a piece of steel tube and chamfering the end. For the centre hole, I did the same except that I turned a bush to fit inside the large punch so that the one for the centre hole was a sliding fit and central; it was only a

(*Continued on page* 751)

READERS' LETTERS

● Letters of general interest on all subjects relating to model engineering are welcomed. A nom-de-plume may be used if desired, but the name and address of the sender must accompany the letter. The Managing Editor does not accept responsibility for the views expressed by correspondents.

STROBOSCOPIC EFFECTS

DEAR SIR,—Mr. E. C. Wright's letter on stroboscopic speed measurement contains a number of errors. First, accepting his formula as correct, then synchronous frequency is 6,000 r.p.m. Dividing by the number of jaws gives 1,500 for a four-jaw chuck, and 2,000 for a three-jaw chuck, "*or any multiple of these numbers*." In between these harmonic frequencies, the object will appear to accelerate from zero to maximum and fall to zero again, changing apparent direction between each pair of harmonics. Below the minimum harmonic frequency, you would probably get the illusion of an increased number of jaws, i.e., at 750 r.p.m. a four-jaw will appear as an eight-jaw chuck. It must also be remembered that at any other speed than 6,000 all radial inaccuracies will appear as radial vibrations.

In my letter of March 26th I mentioned that the effect can be seen with a single filament lamp.

A proper "Stroboflash" owes its effect to the fact that its light output is very intense for a very short period of time, possibly only a few micro-seconds, and the black-out periods comparatively long, as the object must not be allowed to move very far. To hazard a guess, I would say that these instruments are basically a photographer's electronic flash with a variable-speed motor-driven switch, and must be used in total darkness.

The fluorescent light does, of course, have instances of zero value, but they are also of zero duration, so movement will always be apparent under this illumination. I am open to correction by an electrical engineer on this following point. I know that when current and voltage are in phase with each other, the power curve is a number of loops at twice supply frequency, but when they are out of phase with each other the power curve will consist of a number of loops at four times supply frequency, half of them being negative. For any power consumption at all, the negatives will be smaller than the positives. The light from a tube, should be 200 "flashes" per second in a dot-dash order.

Yours faithfully,
East Ham. A. E. CLAUSON.

DEAR SIR,—I have noted in several recent issues of THE MODEL ENGINEER a reference to fluorescent lighting in workshops, and the system I have had in use for several years with very satisfactory results may interest other readers.

In the first place I have found the stroboscopic effect far more pronounced with fluorescent tubes of the colour known as "daylight" than with "white" or "soft white." Also, it should be remembered that fluorescent tubes are good for a certain number of "starts," and they are, therefore, best used for periods of about four hours at a time.

Accordingly, I have fitted my shop with a 150 watt ordinary globe in the centre of the room, in a large industrial type shade and a switch near the door. Then at one end of the shop is a fixture with a single 20-watt "white" fluorescent tube and at the other end of the shop another similar one hangs over the lathe, and can be moved to the planer. These two have plugs and can be used independently. With all three on, the lighting effect is very good, there is practically no stroboscopic effect and very little shadow indeed on the lathe, and total consumption is only 190 watts. The shop is 20 ft. long by 12 ft. wide.

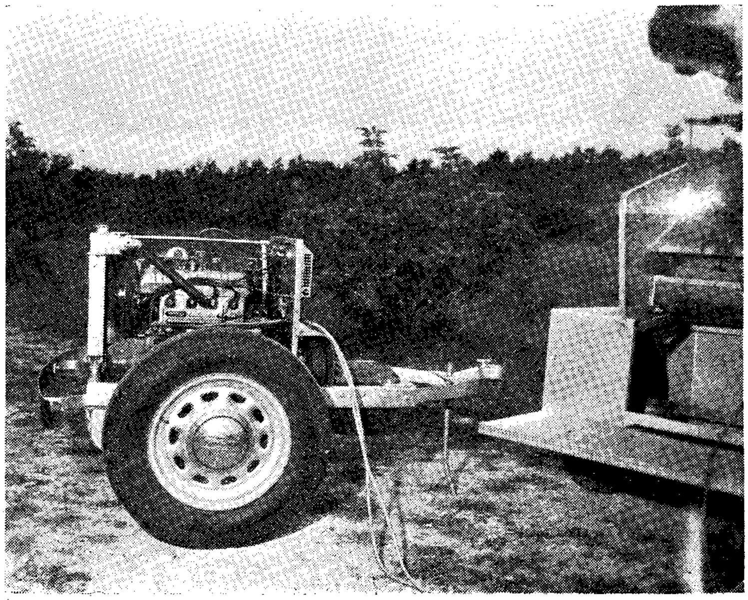
It should be remembered that the powder on the inside glass of a fluorescent tube is poisonous, and if one is broken it should not be allowed to get into cuts on the hands, nor should the powder be inhaled; in fact, the room should be vacated until the dust settles.

Yours faithfully,
Stanger, Natal. A. J. CANNON.

GENERATORS FOR WELDING UNITS

DEAR SIR,—May I take friendly issue with your reply in THE MODEL ENGINEER to a querist under date of March 26th, 1953? N.W.L., of Ivybridge, asks whether a P1 aircraft generator rated at 200 amp and 28.5 volts can be used as a welding unit, and is told that it cannot, as the voltage is too low.

In this country such generators are widely sold by surplus-materials dealers for precisely this purpose, and on a recent trip to Florida I saw one at work. It happened to be an R1 instead of a P1, but the



output voltage of these is identical, the R1 being a 300-amp machine. I saw this weld $\frac{1}{4}$ in. thick steel angle and inspected several agricultural implements which had been built with the outfit. The welds were of professional quality.

New York, U.S.A.

Yours faithfully,
HARRY WALTON.
Editor, *Mechanics & Handicraft*.

ALUMINIUM CASTING

DEAR SIR,—On reading the reply to "B.G.R." (Dewsbury) on page 604, May 14th, issue, *re* aluminium castings, it has occurred to me that although the answer is quite clear, there may be some element of risk and possible injury to persons using the information. I refer to the source of material, i.e. motor-car pistons and crankcase metal. I have used the former myself on one or two occasions and this is quite satisfactory. The danger appears to me to be in using what seems to be aluminium but what, in fact, could be elektron, or magnesium alloy. I believe crankcases and certain typewriter parts, etc., have been made in these alloys, and if an attempt was made to melt this on an open fire a very dangerous situation could arise. I am perhaps stressing this unduly and it may be that someone with more metallurgical knowledge could say. However, in view of the fact that most amateurs would not readily identify the one from the other if they came by them via the scrap box, I suggest that a little warning note might be given in THE MODEL ENGINEER regarding the indiscriminate use of what *appear* to be aluminium alloys.

Yours faithfully,

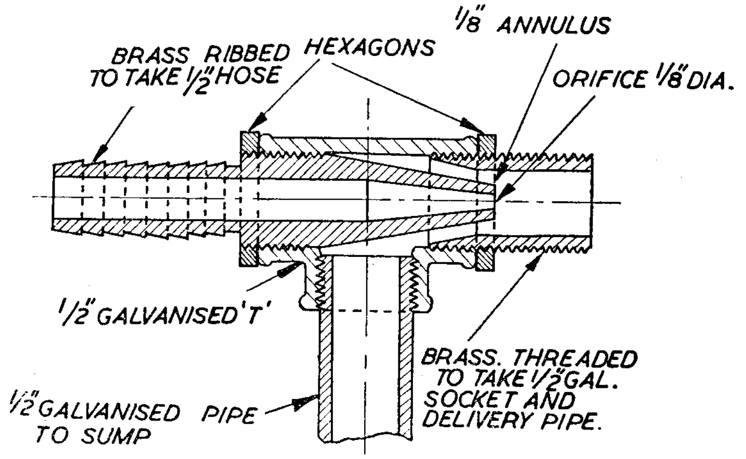
Horwich. W. H. BALSHAW.

EJECTOR PUMPS

DEAR SIR, The enquiry from your correspondent E.H.E. ("M.E.," February 2nd, 1953) prompts me to describe an ejector, which I made hurriedly a few years ago when my cellar was flooded, and which works perfectly. The body, as shown in the sketch, is a $\frac{1}{2}$-in. galvanised "T" as used for water pipe. It can be bought for about a shilling. The water jet and the delivery nozzle are turned from $\frac{7}{8}$ in. hex. brass, the contours being there or thereabouts—roughly as shown by my trusty "Molesworth" handbook. To prime the device, the thumb is placed over the outlet for a moment; this drives the contained air down the suction pipe. On releasing, a steady stream of water emerges. In my case the water pressure is about 60 p.s.i., the lift 8 ft. and the output about 100 gals. per hour.

Melbourne, Australia.

Yours faithfully,
"NORTH-S-WEST."



A PORTABLE COMPRESSOR UNIT

(*Continued from page* 749)

few minutes' work to punch all the felt rings.

The air receiver is $6\frac{1}{2}$ in. diameter by 16 in. long and is made out of a piece of steel pipe. I was fortunate in being able to buy two end-caps domed out and just the size. The various bosses are turned from mild-steel, and I was able to get it electrically welded at a local works. Also welded on the bottom are two flat strips for bolting down.

The problem of wheels to move all this weight was rather difficult, as suitable wheels could not be found, and those of a pram type are not strong enough. I eventually made a pair, as can be seen in the photographs, by using two pieces of steel pipe the same size as the air receiver. A steel plate was fitted inside, with a boss, and then electrically welded; afterwards, these were set up in the lathe and grooved to fit a pair of seamless rubber pram-type tyres. The wheel axle is a piece of $\frac{5}{8}$-in. mild-steel, and passed through the 1 in. angle frame; the handles are made from $\frac{3}{4}$ in. diameter steel pipe, and bicycle handlebar grips are fitted. The belt guard is made of sheet metal and gas welded together.

On the air inlet port of the compressor, it will be noticed that no air filter has been fitted. This has to be made, but up to now it has been used without one. I had intended fitting a filter off one of the old civilian gas masks, as this seems to me to be an ideal thing for the job, but unfortunately I left it lying about, and my dog damaged it to such an extent, that it was beyond salvage. It is advisable to fit a filter on compressors of this type on account of dust, etc., which can enter and foul the flat reed valves on the valve-plate; these reed valves are just flat pieces of spring steel, with a spring behind them to keep them flat down on the port drilled in the valve-plate. Some types of valves are circular or oblong, and many other shapes are available as well; if these valves lose their flatness, it means fitting new ones, as it is extremely difficult to get them air-tight again.

The building of this little unit has proved an interesting job, and I have certainly learnt a lot more about these things, than when I started. One other little point that is worth mentioning, is that, even with the smallest of air leaks in a unit, it is surprising how quickly the air pressure drops, and with a small unit of this sort it is an important point.

I have written this article in the hope that it may be of some help to those who, up to now, have not got a compressor unit of their own, and are un-informed as to what these ex-refrigerator compressors will do.

QUERIES AND REPLIES

"THE M.E." FREE ADVICE SERVICE. Queries from readers on matters connected with model engineering are replied to by post as promptly as possible. If considered of general interest the query and reply may also be published on this page. The following rules must, however, be complied with:
(1) Queries must be of a practical nature on subjects within the scope of this journal.
(2) Only queries which admit of a reasonably brief reply can be dealt with.
(3) Queries should not be sent under the same cover as any other communication.
(4) Queries involving the buying, selling, or valuation of models or equipment, or hypothetical queries such as examination questions, cannot be answered.
(5) A stamped addressed envelope must accompany each query.
(6) Envelopes must be marked "Query" and be addressed to THE MODEL ENGINEER, 19-20, Noel Street, London, W.1.

Drilling Machine Construction

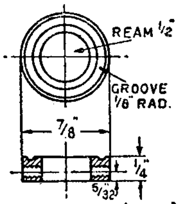
I propose to build a precision drill as described in THE MODEL ENGINEER *dated November 22nd,* 1951, *but have not been able to understand the detail drawings.*

Will you please give me further details about the thrust-race, and explain where it is fitted?

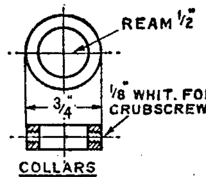
A.R.C. (Croydon).

The thrust-race is fitted at the top end of the drill spindle, the lower of the two components being loose on the shaft, and the other assembled between the side plates of the feed lever as shown in our sketch, where it is held in place by two pivot screws which allow it to maintain proper alignment as the lever is moved through an arc.

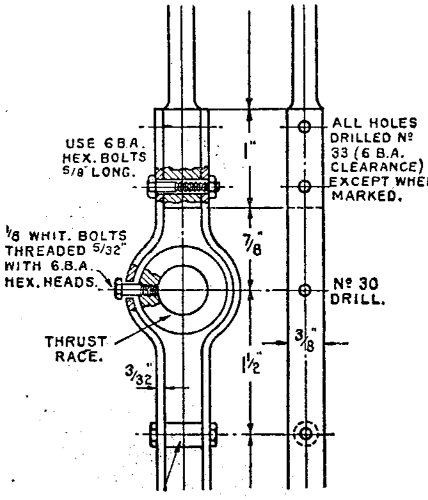
The space between the races is filled with twenty-four $\frac{1}{8}$-in. balls, which run in the grooved tracks of the races, and to prevent end play, one of the collars, also shown in this drawing, is grub-screwed or pinned to the extreme upper end of the spindle.



THRUST RACE (2 OFF).
M/S CASE HARDENED.
USE APPROX. 24 ⅛" STEEL BALLS.
USE 2-⅛" WHIT. GRUBSCREWS IN BOTTOM HALF.



COLLARS
1 OFF IN M/S (BOTTOM OF SPINDLE).
1 " " PHOS. BRONZE (TOP).



Pressure Regulating Valve

With reference to the article in the May 18th, 1950, *issue of* THE MODEL ENGINEER *on compressed air equipment by "Duplex." I am building a compressed air plant similar to the one described, and can find no reference to the construction of the regulating valve.*

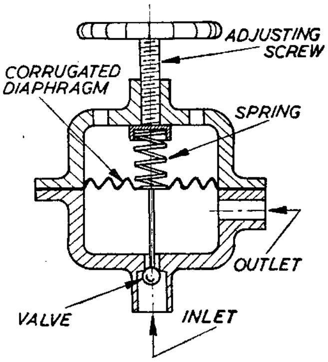
(*a*) *Will you please tell me if a suitable valve has been described in any issue of* THE MODEL ENGINEER, *or*

(*b*) *Let me have a sketch of the valve, showing the principle on which it operates.*

K.W.B. (London, W.4.)

We presume that by the term regulating valve you mean the reducing valve which is used to ensure a constant pressure output on the output line of the compressor Generally speaking, reducing valves of this type are obtained ready-made, but it would not be impossible to make one which would work quite satisfactorily, and we give a sketch which shows the principle on which they operate.

Air is admitted to the valve chamber by way of an inverted ball or mushroom valve of small diameter, which is controlled by means of a diaphragm loaded by an adjustable spring. It will be seen that when the pressure in the valve chamber becomes sufficiently high to deflect the diaphragm against the loading of the spring, the valve will be closed until the pressure in the chamber is reduced by outflow of air from the outlet. In practice, the diaphragm allows the valve to open to a sufficient extent to keep pace with the rate at which air is delivered at the outlet.



By varying the compression of the spring by means of an adjusting-screw, the outlet pressure can be controlled to the required amount and will be kept constant even if the pressure at the inlet varies, so long as it is at least higher than that required at the outlet.

Workshops in Confined Spaces

I believe that several articles have been published in THE MODEL ENGINEER *on the subject of arranging workshops in cases where space is very limited. Can you refer me to any of the dates of issues in which these articles appeared?*

L.M.T. (Aberystwyth).

We have published several articles on workshops designed to fit in very small spaces or to be capable to being camouflaged as articles of furniture.

"A Pocket Size Workshop," October 13th, 1949.

"A Cupboard Workshop," October 20th, 1949.

"A Cabinet Workshop," August 12th, 1948.

"A Cabinet Workshop With a Difference," January 15th and 22nd, 1948.

"A Novel Portable Workshop," October 4th, 1945.

"A Portable Workshop," February 22nd, 1951.